AD-A103 449 TULSA UNIV OK LAB OF ARCHAEOLOGY F/G 5/6

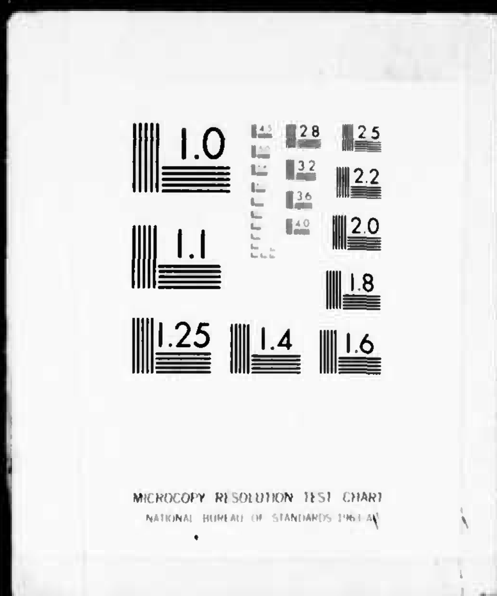
THE PREHISTORY AND PALEOENVIRONMENT OF HOMINY CREEK VALLEY 1978--ETC(U)

1978 D O HENRY DACW56-77-C-0222

UNCLASSIFIED NL

1 OF 1

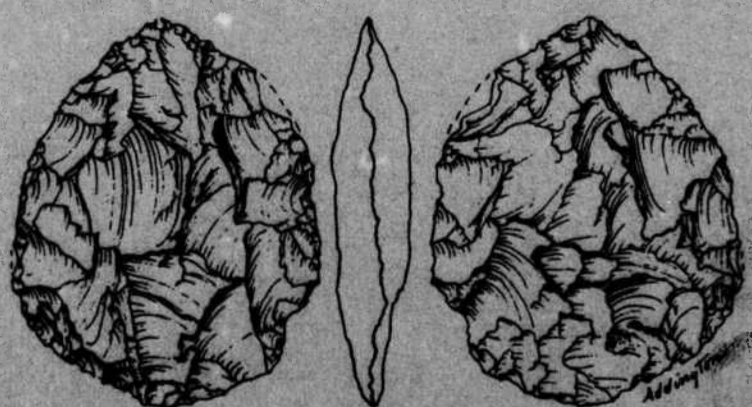
AD
A103449



The Prehistory and Paleoenvironment of Hominy Creek Valley

Contract DACW-56-77-C-0222

1978 Field Season



Donald O. Henry

THE PREHISTORY AND PALEOENVIRONMENT OF HOMINY CREEK VALLEY 1978 FIELD SEASON

LEVEL II

12

6

THE PREHISTORY AND PALEOENVIRONMENT OF HOMINY CREEK VALLEY 1978 FIELD SEASON

10 Donald O. Henry

11 1978

Artifact Illustrations
LUCILE ADDINGTON

Accession For	
NTIS GRA&I	X
DTIC TAB	☐
Unannounced	☐
Justification	
By Per Ltr. on file	
Distribution/	
Availability Codes	
Dist	Avail and/or Special
A	

LABORATORY OF ARCHAEOLOGY
~~DEPARTMENT OF ANTHROPOLOGY~~
UNIVERSITY OF TULSA

SKIATOOK LAKE PROJECT
15 DACW56-77-C-0222

12 76

ACKNOWLEDGEMENTS

During the course of the Phase II investigation numerous people contributed their efforts and skills to the successful completion of the study.

I would like to offer my appreciation to Craig Woodman who served as field director and the crew of Celia Wetherill, Judy Northrup, Melanie Hillman, Dory Penny, Kurt Long, and Lynn Rivers. I would also like to thank Foster Kirby for assistance in limited fieldwork conducted during the spring of 1979 and in the preparation of the manuscript. Celia Wetherill and Anne Justen assisted in various phases of the laboratory analysis in conjunction with assisting in the preparation of the report.

I am indebted to Lucile Addington for her usual superb artifact illustrations, Terry McClung for drafting, Virginia Arvidson for typing, and Kathy Henry for proofreading the final manuscript.

Finally, I would like to offer my appreciation to the people of Hominy Creek Valley for their interest and cooperation.

CONTENTS

LIST OF FIGURES

LIST OF FIGURES
(continued)

LIST OF TABLES

LIST OF TABLES
(continued)

ABSTRACT

During 1978 and 1979, the Phase II archaeological investigation of Skiatook Lake was conducted in partial fulfillment of Contract No. DACW56-77-C-0222 with the Tulsa District, Army Corps of Engineers. The investigation entailed the excavation of eight sites (34OS90, 34OS91, 34OS101, 34OS160, 34OS84, 34OS92, and 34OS105). Two additional sites (34OS93 and 34OS110) initially scheduled for excavation had been destroyed by road construction activities prior to the study.

The investigation resulted in the identification of the cultural-historic components present at the sites, the correlation of these components with the alluvial and environmental history of the valley, and the definition of a settlement pattern for the Late Prehistoric (Plains Woodland and Plains Village Period) inhabitants of the valley.

INTRODUCTION

During 1978 and 1979, an archaeological investigation was conducted in Hominy Creek Valley in the area of the proposed Skiatook Lake (Figure 1). The investigation entailed the excavation of four sites (34OS90, 34OS91, 34OS101, and 34OS160) and the test excavation of four sites (34OS84, 34OS89, 34OS92, and 34OS105). Although two additional sites (34OS93 and 34OS110) were scheduled for investigation, both sites had been destroyed through road construction activities prior to the Phase II study.

General Goals and Conceptual Framework

The Phase II investigation followed the program of study which was designed in 1976 (Henry, 1977l: 105). The program stresses the recovery, analysis, and synthesis of evidence which will provide for the development of detailed paleoenvironmental and cultural-historical sequences for the valley. The generation of these sequences is viewed as an initial step in examining the interrelationship of the inhabitants of the valley and their environment for much of the prehistoric past.

One of the current fundamental concerns of anthroplogy is understanding human adaptive strategies, that is, the ways in which populations select and secure resources from their environment. Many scholars, in fact, perceive culture as presenting man's primary means of adaptation. Ar-

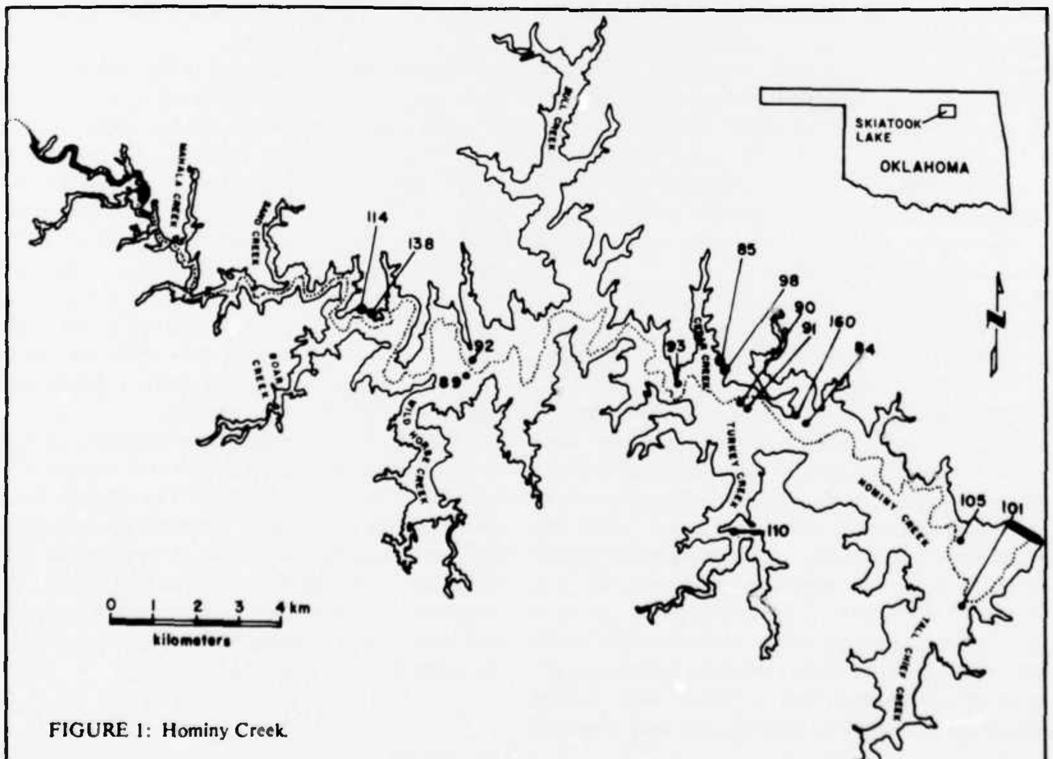


FIGURE 1: Hominy Creek.

chaeology, as a discipline, is in a unique position for elucidating adaptive patterns through tracing and evaluating cultural responses to environments over exceedingly long time spans. Although as a result of these observations environmental reconstruction is emphasized in the program of study, environmental settings are not viewed as having dictated or determined specific adaptive responses and cultural patterns.

Anthropological literature, in fact, abounds with examples of diverse adaptive responses to similar environments. Environment, therefore, is viewed as placing broad parameters on adaptive options and perhaps representing the prime mover in human adaptive evolution.

Hominy Creek Valley is an ideal study area for the examination of prehistoric adaptive strategies due to the temporal span of the prehistoric occupations and the physiographic setting of the valley. The prehistoric occupation of the valley encompasses a period which is associated with the transition from hunting and collecting to food production. Within the region, the Plains Woodland Period (ca. A.D. 1-800) is traditionally viewed as being economically transitional between Archaic Period hunters and gatherers and Plains Village Period horticulturalists. The acquisition of a food-producing economy by Late Prehistoric populations in the region clearly represented an important change in adaptive strategy.

The valley is located in a zone of low oak-covered hills which form a boundary between the grasslands of the Plains to the west and the oak-hickory forests to the east. In that the valley is situated in an environmental transition zone, subtle differences in relief, exposure, and available moisture have created a complex mosaic of microenvironments which contain plant communities characteristic of the major grassland and forest zones which are peripheral to the valley. The microenvironmental diversity of the area appears to have persisted over the last 2,000 years. The valley offers an ideal location for detecting subtle environmental oscillations due to its boundary position between major environmental zones. Such a setting offers distinct advantages over environmental core area locations for reconstructing paleoenvironmental sequences.

As a result of previous investigations in the valley, tentative cultural-historic and paleoenvironmental sequences have been developed (Henry 1977a, 1978a, 1978b). These sequences reveal an indigenous evolution of the valley inhabitants from Plains Woodland through Plains Village times with subsistence and settlement systems remaining remarkably static. Perhaps the most notable aspect of the prehistoric economies of the valley is the apparent absence of horticulture during Plains Village times. The persistence of hunting and collecting subsistence modes may have been related to the ability of the inhabitants of the valley to maintain a subsistence-population equilibrium for about 1,500 years. This equilibrium was apparently maintained in spite of the onset of drier conditions during the ninth century A.D.

Specific Goals of the Phase II Investigation

During Phase II, the focus of the archaeological investigation of Hominy Creek Valley shifted from protected sites located in the cliffs along the flanks of the valley to open sites primarily situated on the valley floor. The excavation and testing of the open sites specifically addressed the problems of correlating the alluvial sequence of the valley with the environmental and cultural-historical sequences identified in the deposits of the previously investigated sheltered sites. Additionally, the examinations of the open sites was directed toward integrating the protected and open encampments into an overall settlement system.

Although the investigation principally entailed the excavation of open sites, two rockshelters were included in the Phase II study. The excavations of these shelters emphasized the recovery of cultural and environmental evidence in association with radiometric determinations in order that detailed comparisons could be made with the cultural-historical and paleoenvironmental sequences from the other shelters in the valley.

SITE REPORTS

Turkey Creek Shelter (340S91)

The site, found within a rockshelter, is situated at the base of a steep sandstone cliff overlooking the confluence of Turkey and Hominy creeks. A bedrock pillar separates the shelter into northern and southern sections with a connecting passageway behind the pillar. The shelter, facing northwest, extends approximately 24m along the cliff and averages about 8m in depth behind the dripline (Figure 2). Although the ceiling of the shelter is irregular, it consistently exceeds 2m in height. The shelter has apparently formed through exfoliation induced by the fluctuating moisture content of the porous sandstone. The sediment on the bedrock floor of well-protected portions of the shelter has obviously been derived from the "blistered" ceiling while surface sediments in the entrance area near the dripline appear to have been introduced from over the edge of the cliff.

Although an extensive talus slope has developed in front of the site, the shelter lacks a level terrace which is often associated with caves and rockshelters. The absence of a terrace and the steepness of the talus slope suggest that the roof of the shelter has recently retreated towards the face of the cliff. A relatively recent period of roof fall is indicated by the numerous large sandstone blocks which are located in the southern section of the shelter since they overlay sediments containing prehistoric artifacts. An earlier episode of roof collapse, however, is evidenced by a large sandstone block, positioned in the northern section of the shelter, which rests on bedrock and exhibits prehistoric features in the form of conical deep-hole mortars.

The site, well known by amateur archaeologists, was initially recorded by Rohrbaugh and Wyckoff (1969) and subsequently was investigated by Gettys, Layhe, and Bobalik (1976:81-93). During the 1974 study, a series of test pits and trench were excavated within the shelter. In addition to identifying the stratigraphy of the site, the excavation yielded a limited number of artifacts in association with faunal remains. On the basis of the recovered evidence, additional excavation was recommended, particularly on the talus slope.

Description of the Excavation

The strategy for the excavation of the shelter, conducted during the Phase II investigation, was based upon the recommendations from the previous studies of the site and upon the overall goals of the project, as previously defined. The excavation specifically focused on recovering artifactual, economic, and environmental evidence from well-dated stratigraphic columns.

The excavation consisted of a series of contiguous units which extended the 1974 test trench (107N-98E; 107N-99E; 107N-110E) of Gettys, Layhe, and Bobalik (1976:82-83), both in depth and downslope on the talus. These units, which included H11-H14, and G11-14, were excavated to ascertain the depth of the cultural deposit and to establish the stratigraphy of the talus slope. In utilizing the test trench of the 1974 excavation, a deep controlled sounding was accomplished economically; and a single stratigraphic section was extended into the talus slope from behind the dripline of the shelter.

Although the excavation of this block of units provided a detailed understanding of shelter stratigraphy in conjunction with a series of charcoal samples for radiometric dates, the artifact samples were clearly insufficient for addressing other goals. In an effort to increase the samples of both cultural and economic evidence, four additional 1 x 1 m units (E11, F11, I11, and J11) were excavated along a north-south line at the western end of the block excavation. Unfortunately, these units failed to substantially increase the recovery of cultural and economic data. The additional units, however, furnished information on the extent of the occupation of the shelter.

The methodology employed in the excavation was consistent with the methods utilized since the beginning of the archaeological investigation of

Hominy Creek Valley by the Laboratory of Archaeology, University of Tulsa (Henry, 1977a, 1978a, 1978b). Excavation units consisted of 1 x 1m squares subdivided into quadrants for precise horizontal provenience. Excavation levels were dug in 10cm intervals which were controlled by a transit and line levels. Although the site was excavated in arbitrary horizontal levels, these levels were broken at stratigraphic contacts and when features were encountered. All of the matrix from the excavation was screened through 1 mm mesh for the recovery of minute artifactual, economic, and environmental evidence. Sediment columns were collected from the north wall of unit G13 for pollen and geologic analyses.

Stratigraphy

The stratigraphy of the shelter deposit consists of three major layers with minor variations within the

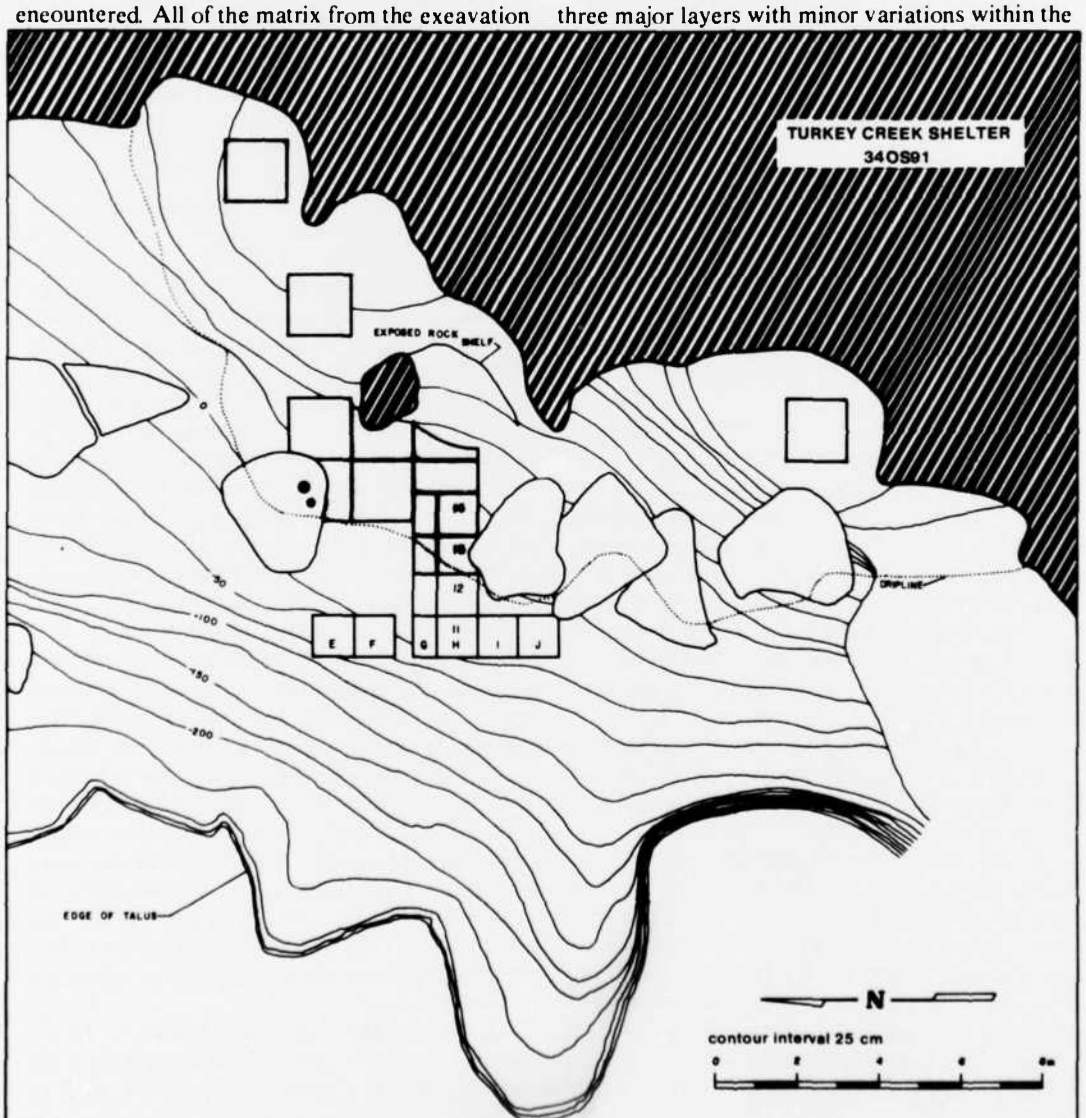


FIGURE 2: Site Map of Turkey Creek Shelter (34OS91).

strata (Table 1). In general, the layers display distinct contacts and follow the slope of the underlying sandstone bedrock (Figure 3).

Layer A, consisting of a fine grained dark yellowish brown (10YR 4/4) sandy silt with a small fraction of clay sized sediments yielded prehistoric artifacts in association with modern bottle glass, tin cans, and other assorted trash left by hunters and campers. Although charred materials were abundant in the strata, it could not be determined whether they were prehistoric or intrusive from the numerous modern hearths within the shelter. The sediments in this layer were slightly basic (pH 7.3) with a consistence that would be classified as hard when dry.

Layer B, a dark brown (7.5YR 4/2) sandy silt, contained relatively high densities of chipped stone artifacts and limited faunal remains. The layer apparently represented the most intensive period of occupation of the site. Charred nuts were recovered in considerable abundance, and radiocarbon dates are forthcoming for samples collected from the upper and the lower parts of the layer. Again the sediments are slightly basic and have a consistence which is slightly hard.

Layer C, composed of a reddish brown, (5YR 4/4) sandy-silt, furnished chipped stone artifacts and a few faunal remains. The layer, however provided sufficient charcoal samples for a radiocarbon date which is forthcoming. The pH is slightly basic with a hard consistency rating.

The stratigraphy of the site documents the migration of the roof toward the face of the cliff and confirms that during the initial occupation of the site, equivalent with the deposition of Layer C, the shelter extended out at least two meters further from the cliff than it does today. Layer C sediments were derived from the ceiling of the shelter as they are today and, in fact, these sediments emerge as surface sediments covering the shelter floor behind the dripline. Although the exposed Layer C sediments are considerably thinner than the buried facies, perhaps as a result of wind erosion, the Layer C deposit was clearly formed by the same geomorphic process—namely the granular exfoliation of the shelter ceiling. It therefore follows that the distribution of Layer C defines the former extent of the shelter. With the retreat of the roof of the shelter toward the cliff face, sediments were introduced from over the edge of the cliff and Layer C was buried. These deposits, defined by a higher fraction of fine grained sediments and water worn sandstone detritus, are represented by Layers A and B.

Apparently, the lack of a terrace in front of the shelter is a result of the continual retreat of the roof which established a near equilibrium between erosion and deposition, thus negating the typical over-edge terrace deposit. Regardless of what geomorphic process was reponsible for the comfortably inclined stratigraphy of the talus, it is evident that the shelter never contained a level living surface of any great size.

TABLE 1

Description of Sediments from Turkey Creek Shelter (34OS91)

Layer	Color, Hue/Chroma	Texture	Consistence	pH
A	Dark yellowish brown 10YR 4/4	Sandy silt some clay	Dry-hard wet-friable	7.3
B	Dark brown 7.5YR 4/2	Sandy silt	Dry-slightly hard Wet-very friable	7.2
C	Reddish brown 5YR 4/4	Sandy silt	Dry-slightly hard Wet-very friable	7.3

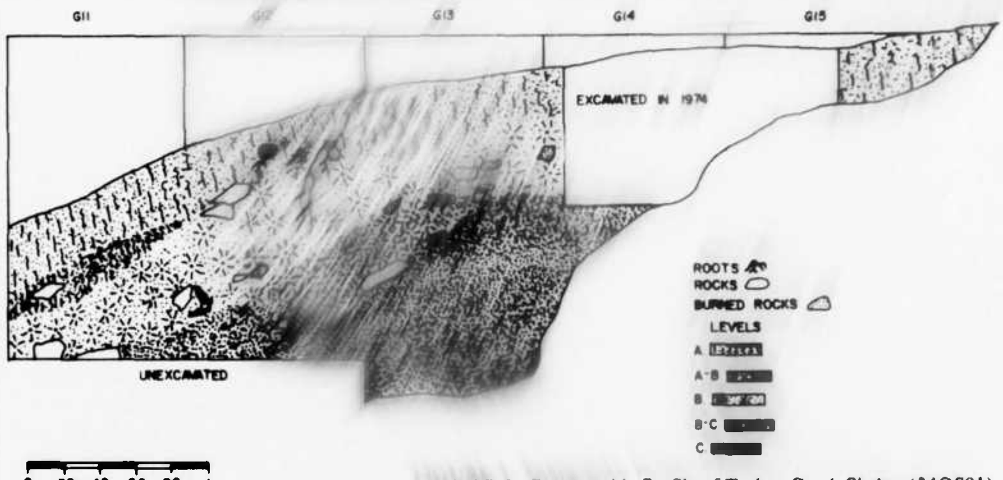


FIGURE 3. Stratigraphic Profile of Turkey Creek Shelter (34OS91).

Features

Archaeological features included two bedrock mortars and a shallow pit within unit I13. The mortars both measured 10cm in diameter at their openings and exhibited depths of 22cm and 28cm. Morphologically the mortars are conical and appear to have been formed in the bedrock through a rotary motion.

A shallow pit, defined by a dark stained sediment, was discovered in Layers B and C of unit I13. The oval pit approximately 50cm deep, flared from a bottom width of about 45cm to a top width of approximately 60cm. Although the pit penetrated Layer C, it originated from a former surface within the middle of Layer B. The matrix recovered from the depression was flotated; however, only a few charred nut remains were recovered.

Recovered Artifacts

Although the material culture recovered during the excavation primarily consisted of chipped stone artifacts, a limited number of groundstone specimens were recorded. The inclined stratigraphy of the site necessitated the grouping of the recovered artifactual assemblages by stratigraphic layers as opposed to excavation levels for comparison.

The typological and technological analyses of the chipped stone assemblages followed the procedures employed and described in detail in the earlier phases of the investigation (Henry, 1977a, 1978a, 1978b).

Chipped Stone Tools

Only a small number of chipped stone tools were recovered from the Turkey Creek Shelter deposit. Although the small samples of tools may, in part account for the limited range of tool varieties, the assemblages when combined will display a tool-kit which is dominated by points and retouched pieces (Table 2).

Layer A included 9 tools represented by a unilateral obversely retouched flake, an elongated biface with lateral, beveled retouch (Figure 4d), and 78 points. The points included 4 bases of small side-notched specimens, a small point tip, the base of a large contracting stem specimen with the platform intact, and a small side-notched specimen (Figure 4b).

Layer A/B contained only 5 tools: a simple perforator formed by adjacent retouched concavities on a large, thick flake; a marginally bifacial retouched piece; a flake bearing unilateral obverse abrupt retouch; the tip of a small point; and a small side-notched point with a serrated blade.

Layer B furnished 18 specimens representing scraper, notch, retouched piece, biface, and point classes. A single triangular end-scraper fashioned from a large broken biface was recorded. The notch appeared on a broken flake with the break emanating from the edge of the retouched concavity forming the notch. Retouched pieces included 4 flakes bearing normal unilateral obverse retouch and a flake with unilateral inverse retouch (Figure 4c). The biface class was represented by a broken bifacial fragment. Points consisted of 4 small point bases, 4 small tips, the base of a large corner-notched point, and a small side-notched point (Figure 4a).

Layer C contained only 4 tools: 2 broken retouched pieces, a small point base, and a small point tip.

Non-Tool Elements

The 1,372 non-tool elements recovered during the excavation primarily consisted of tertiary elements with lesser numbers of bifacial thinning, secondary, and primary elements (Table 3). The proportionate representation of the various non-tool element classes shows only minor variation between layers. The similiarity in the configurations of the non-tool elements between layers implies that there was an overall continuity in the lithic technology of the prehistoric inhabitants of the site.

The distribution of non-tool elements reflects an emphasis on the final stages of tool fabrication. The high frequencies of tertiary elements and consistent occurrence of bifacial thinning elements are expressions of final tool fabrication and maintenance activities. On the other hand, the paucity of primary and secondary elements, in conjunction with an absence of cores, denotes the lack of core preparation and decortification activities associated with initial blank production.

A comparison of the dimensions of the various non-tool elements confirms a reduction sequence with primary, secondary, tertiary, and bifacial thinning elements decreasing in size according to their sequence of detachment (Table 4, Figure 5). When the dimensions of tools are compared to the dimensional distribution of non-tool elements, it becomes

TABLE 2

Tool Group Counts from Turkey Creek Shelter (34OS91)

Layer	Scraper N %	Denticulate N %	Notch N %	Burin N %	Perforator N %	Drill N %	Retouched Piece N %	Knife N %	Biface N %	Dart N %	Arrow N %	Point/ Biface N %	Multiple/ Varia N %	Total N
A	– –	– –	– –	– –	– –	– –	1 11.1	– –	1 11.1	1 11.1	6 66.7	– –	– –	9
A/B	– –	– –	– –	– –	1 20.0	– –	2 40.0	– –	– –	– –	2 40.0	– –	– –	5
B	1 5.6	– –	1 5.6	– –	– –	– –	5 27.8	– –	1 5.6	1 5.6	9 50.0	– –	– –	18
C	– –	– –	– –	– –	– –	– –	2 50.0	– –	– –	– –	2 50.0	– –	– –	4
Total	1 2.8	0 0.0	1 2.8	0 0.0	1 2.8	0 0.0	10 27.8	0 0.0	2 5.6	2 5.6	19 52.8	0 0.0	0 0.0	36

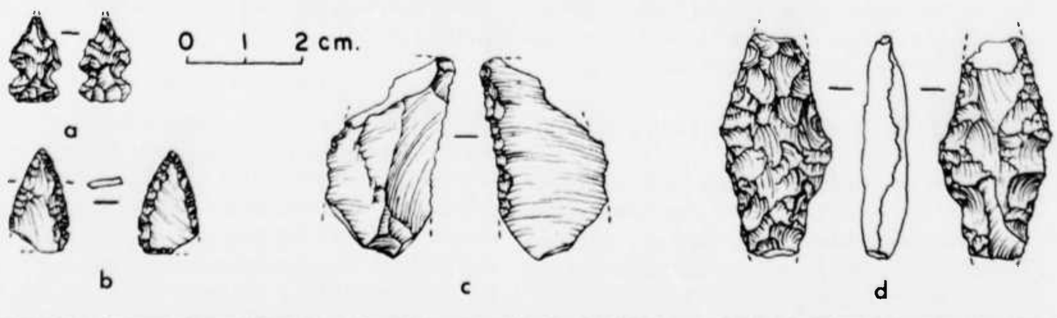


FIGURE 4: Selected Chipped Stone Tools from Turkey Creek Shelter (34OS91); *a*-small side-notched point, *b*-small side-notched specimen, *c*-flake with unilateral inverse retouch, *d*-elongated biface with lateral, bevelled retouch.

TABLE 3

Non-tool Element Densities, Counts, and Frequencies from Turkey Creek Shelter (34OS91). Density is based on number of elements/0.1 cu m of excavated fill.

Layer	Non-tool Density	Primary Element N	Primary Element %	Secondary Element N	Secondary Element %	Tertiary Element N	Tertiary Element %	Bifacial Thinning Element N	Bifacial Thinning Element %	Core Trimming Element N	Core Trimming Element %	Chunk N	Chunk %	Total N
A	4.1	–	–	13	6.6	163	83.2	18	9.2	–	–	2	1.0	196
A/B	2.3	–	–	–	–	26	92.9	2	7.1	–	–	–	–	28
B	8.1	4	0.5	44	5.4	696	85.7	67	8.3	1	0.1	–	–	812
B/C	4.0	–	–	2	16.7	10	83.3	–	–	–	–	–	–	12
C	6.5	2	0.6	13	4.0	281	86.7	27	8.3	–	–	1	0.3	324
Total		6		72		1,176		114		1		3		1,372

apparent that few if any tools were manufactured from blanks at the site. In that the tools are considerably larger than the non-tool elements, it seems reasonable to conclude that most of the non-tool elements resulted from the maintenance and rejuvenation of tools which were brought into the site in finished form.

In an attempt to identify the varieties or variety of load which were employed in the production of non-tool elements, their thicknesses were compared to those of experimentally produced flakes (Table 5). The experimental results not only demonstrated that flakes generated by percussion could be distinguished from flakes produced by pressure but the study also indicated that percussion flakes were thicker than pressure derived flakes (Henry, Haynes, and Bradley, 1976). Although the elements from the shelter evince thicknesses which are less than the thicknesses of the experimentally produced pressure flakes, they are more likely to have been generated by pressure than percussion flaking.

Raw Material: Chert Varieties

Although five varieties of chert were utilized for chipped stone implements, Florence and Keokuk cherts were the predominantly used raw materials (Table 6). The proportionate representation of chert varieties appears about the same for tools as non-tools and the occurrence of thermal alteration is also about the same for the two categories.

If the small samples are ignored and only the non-tool elements from Layers A, B, and C are considered, a stratigraphic trend of changing chert selection is revealed. The utilization of Keokuk chert declined during the occupation of the shelter while the usage of Florence chert increased.

Ground Stone

An adze and a possible grinding stone were recovered from Turkey Creek Shelter. The adze exhibits flaking on the lateral margins and one end and grinding on the working bit. The piece, of endurated sandstone, was first roughed out and subsequently smoothed by grinding into its final shape. Its maximum dimensions are 178 x 89 x 18.7mm (length, width, thickness.) Provenience of the piece is uncertain. The possible grinding stone, of friable sandstone, measures 87 x 64 x 36.3mm. The lateral margins of the specimen meet in an acute angle. The piece was recovered from unit H12 at a depth of 20-30cm.

Faunal Remains

Well-preserved faunal remains occurred throughout the deposit, but the density of material was exceedingly low. While the analysis of the faunal assemblage recovered during the Phase II investigation has yet to be completed, a preliminary examination confirms that the assemblage is quite similar to the vertebrate fauna collected during the initial testing of the deposit (Bobalik, 1976). The dominance of deer remains followed in frequency by cottontail rabbit elements is characteristic of both

TABLE 4

Dimensional Data on Unbroken Tools and Non-tool Elements from Turkey Creek Shelter (34OS91)

	N	Length/mm $\overline{X}$	Length/mm S.D.	Width/mm $\overline{X}$	Width/mm S.D.	Thickness/mm $\overline{X}$	Thickness/mm S.D.
Layer A							
Tools	1	21.0	0.0	27.0	0.0	8.3	0.0
Secondary	3	7.3	4.1	7.7	3.8	1.6	0.7
Tertiary	83	4.4	1.5	4.0	1.5	0.6	0.3
Bifacial thinning	19	4.1	0.8	3.5	1.2	0.7	0.3
Layer A/B							
Tools	3	18.0	7.0	25.0	10.5	4.7	4.6
Secondary	1	17.0	0.0	10.0	0.0	2.0	0.0
Tertiary	17	4.6	2.8	5.0	3.5	0.7	0.4
Bifacial thinning	5	4.4	0.9	4.4	1.1	0.8	0.5
Layer B							
Tools	3	20.7	4.9	14.3	5.9	4.9	2.0
Primary	2	28.5	16.2	16.0	2.8	3.9	0.2
Secondary	18	7.4	3.9	7.8	3.9	1.4	1.0
Tertiary	309	4.5	2.5	4.5	3.0	0.9	1.0
Bifacial thinning	64	5.2	4.0	4.9	4.0	0.8	0.5
Core trimming	1	16.0	0.0	2.3	0.0	4.9	0.0
Layer B/C							
Tools	0	0.0	0.0	0.0	0.0	0.0	0.0
Secondary	2	5.0	1.4	2.5	3.5	0.6	0.1
Tertiary	6	7.5	4.7	8.8	0.6	1.1	0.8
Layer C							
Tools	1	12.0	0.0	8.0	0.0	1.9	0.0
Primary	3	15.0	5.3	17.3	7.6	2.7	0.5
Secondary	6	8.3	9.1	9.8	13.6	2.0	2.9
Tertiary	114	5.2	3.1	5.5	3.5	1.1	1.5
Bifacial thinning	23	6.3	4.6	6.3	5.2	1.3	1.7

assemblages.

The small sample (119 identifiable elements) retrieved during the testing phase prevented detailed economic or environmental interpretations for the assemblage. The recovery of some 80 of the 119 elements from Layer A, a strata containing recent as well as prehistoric artifacts, further complicated an evaluation of the assemblage. Unfortunately the additional excavation conducted during the Phase II investigation failed to significantly increase the faunal sample. The distribution of faunal elements is apparently limited to extremely small areas as evidenced by almost 50% of the sample being recovered from a single unit during the testing phase.

Although the small sample of faunal elements recovered during the investigation of the shelter precludes a rigorous quantitative examination of the assemblage, a few general observations can be made. First the remains of deer, cottontail rabbit, fox squirrel, raccoon, woodrat, turkey, catfish, and snapping turtle imply that the nearby riverine forest and aquatic habitats were exploited. Secondly, the

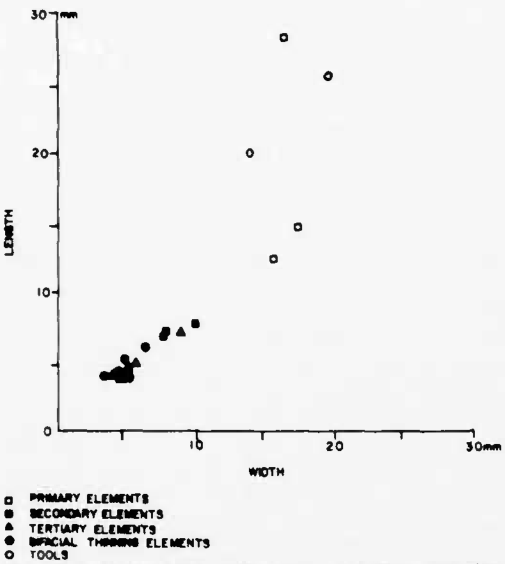


FIGURE 5: Dimensional scattergram comparing unbroken non-tool elements and tools from Turkey Creek Shelter (34OS91). Data points represent mean dimensions by strata for the various artifact classes.

presence of migratory waterfowl in association with a prevalence of deer remains suggests an autumn-winter occupation of the shelter (Bobalik, 1976). Bobalik (1976) cautiously notes, however, that the migratory fowl are limited to the problematic Layer A. On the other hand, it appears unlikely that the avifauna remains would have been introduced to the site by recent visitors.

Other Organic Remains

In addition to the verebrate fauna, organic remains collected from the excavation consisted of four complete valves and numerous fragments of fresh-water mussel shells, terrestrial gastropod shells, and charred walnut, hickory nut, hackberry seed and acorn. The landsnails are currently being analyzed.

Cultural-Historical Affiliations

Turkey Creek Shelter exhibits a similar pattern to other rockshelters and caves within the valley in that it contains both Plains Woodland and Plains Village Period components. Although the results of the radiocarbon analyses of charcoal samples will no doubt bring better resolution to the sequence of occupations within the shelter, the recovery of several temporally diagnostic artifacts provide for a general definition of the cultural-historic succession at the time.

The recovery of several side-notched points from Layer A during the testing and excavation of the shelter indicates a Plains Village Period occupation. Furthermore several plain, shell tempered pottery sherds, identified as Woodland Plain ware, were reported to have come from the Layer A/B contact (Gettys, Layhe, and Bobalik, 1976: 88-90). The pottery is diagnostic of a Plains Village time-frame, as defined in a Caddoan context. The suggested duration of the pottery variety from A.D. 1100-1600 (Gettys, Layhe, and Bobalik, 1976:92) is too late, however, given the appearance of Woodland Plain ware in proveniences dated to as early as A.D. 800 (Henry, 1978a:284-85).

The presence of cord marked pottery (Gettys, Layhe, and Bobalik, 1976) and a large corner-notched point denotes a Plains Woodland Period affiliation for Layer B. The absence of temporally diagnostic artifacts in Layer C precludes the definition of its chronologic placement.

The Hominy Bend Site (34OS101)

The Hominy Bend Site (34OS101) is situated near the tip of a low sandstone ridge on the south bank of Hominy Creek (Figure 6). The site, occupying an area of over 1,200 sq. m. of the level crest of the ridge-toe, is bounded on the north and west by steep slopes which fall away to Hominy Creek and a minor ephemeral tributary. Along its eastern margin the ridge slopes off gently to the Hominy Creek floodplain while the ridge climbs to the flanks of the valley to the south.

The ridge-toe, which exhibits an upland habitat, extends well into the floodplain before being truncated by the modern Hominy Creek channel. The site setting therefore contains a mosaic of upland, floodplain, and aquatic micro-environments in unusually close proximity.

There has been some confusion concerning the identity and location of site 34OS101. The site was initially recorded during a survey in 1972 (Perino,

TABLE 5

Comparison of Mean Maximum Thickness of Non-tool Elements from Turkey Creek Shelter (34OS91) and Experimentally Produced Spall Samples Trapped Between 4 and 10mm Sieves.

Layer	Non-tool Element	N	Thickness/mm $\overline{X}$	S.D.
A	Secondary Element	1	1.8	0.0
	Tertiary Element	51	0.6	0.5
	Bifacial Thinning	17	0.6	0.3
A/B	Tertiary Element	11	0.5	0.2
	Bifacial Thinning	5	0.8	0.5
B	Secondary Element	2	0.7	0.2
	Tertiary Element	246	0.5	0.4
	Bifacial Thinning	46	0.9	1.2
B/C	Secondary Element	2	0.6	0.1
	Tertiary Element	2	0.5	0.2
C	Secondary Element	4	0.6	0.2
	Tertiary Element	74	0.5	0.2
	Bifacial Thinning	14	0.7	0.2
Experimental Spalls	Hard-hammer	61	2.08	1.00
	Soft-hammer	61	1.87	0.43
	Pressure	61	1.29	0.26

1972:8). A subsequent investigation in 1974 failed to locate the site by the coordinates as published in the 1972 report (Gettys, Layhe, and Bobalik, 1976:58). The 1974 investigation recorded another site, believed to represent 34OS101, downstream from the 1972 location and on private land outside the proposed reservoir. Although the supposedly new location of 34OS101 was not excavated, a pit dug by the landowner failed to yield artifacts. During the 1976 University of Tulsa investigation, a prehistoric site was recorded and excavated at the location defined in the 1972 report. In summary, the 1974 investigation failed to correctly identify the location of site 34OS101 and the recommendation in the report (Gettys, Layhe, and Bobalik, 1976:58) should be ignored.

Description of Excavation

The strategy for the excavation of the site was primarily developed for addressing a series of questions which arose from the 1976 investigation (Henry, 1977a: 142:158). These questions pertained to (1) the definition of the subsurface areal extent of the site; (2) the detailed correlation of cultural-historic and stratigraphic successions within the deposit of the site; and (3) the establishment of the absolute antiquity of the sites components.

During the 1976 investigation, the excavation of an 18 sq. m. block in conjunction with two test pits provided limited information on the occupied area of the site. In order to gain a more precise understanding of the size of the settlement, the Phase II investigation included the excavation of 8 test units in addition to continued work on the block area.

The 1976 excavation of the block area identified a transition from a Plains Village to a Plains Woodland or Archaic Period occupation within Level II (10-20cm below surface). In an attempt to more precisely define this contact, the 10-20cm interval

TABLE 6

Raw Material Varieties from Turkey Creek Shelter (34OS91)

	N	Florence %	Foraker %	Keokuk %	Tahlequah %	Neva %	Other %	Heat-treated %
Stratum A								
Tools	7	42.8	1.0	42.8	0.0	14.3	0.0	42.9
Non-tools	196	33.7	0.0	59.7	0.5	5.1	0.0	60.7
Stratum A/B								
Tools	5	40.0	0.0	40.0	20.0	0.0	0.0	100.0
Non-tools	28	39.3	0.0	57.1	3.6	0.0	0.0	53.6
Stratum B								
Tools	22	22.7	0.0	68.2	0.0	9.1	0.0	59.1
Non-tools	812	25.7	0.9	71.8	0.5	1.1	0.0	66.3
Stratum B/C								
Tools	0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Non-tools	12	8.3	0.0	91.7	0.0	0.0	0.0	25.0
Stratum C								
Tools	5	0.0	0.0	100.0	0.0	0.0	0.0	0.0
Non-tools	324	22.2	2.5	72.2	0.0	3.1	0.0	44.1

was excavated in 5 cm increments (i.e. 10-15 cm, 16-20 cm) during the Phase II study of the site.

Finally, in an effort to retrieve dateable material, all of the matrix recovered during excavation was screened through 1 mm mesh in the laboratory. As a result of this screening technique, a charcoal sample sufficient for obtaining a radiocarbon determination was secured from the 20-30 cm interval. The sample is currently being processed.

Stratigraphy

Three stratigraphic layers were encountered in the excavation (Figure 7, Table 7). These consisted of:

Layer A - weak red modern soil.
Layer B - dark brown silt.
Layer C - dark reddish brown sandy clay interspersed with sandstone rubble; perhaps representative of a paleosol A-horizon.

Artifactual material appeared throughout the deposit from each of the stratigraphic layers.

Recovered Artifacts

The artifactual inventory of the Hominy Bend Site is principally confined to chipped stone elements. A few groundstone specimens, pottery sherds, daub, and ochre composed the rest of the assemblage. Aside from a limited amount of charcoal, organic remains were absent from the site as a consequence of poor preservation.

Chipped Stone Tools

A total of 175 chipped stone tools were recovered from the site, with 143 of these coming from the block excavation (Table 8) and the remaining 32 tools coming from the test pits (Table 9). A comparison of the configurations of the assemblages from the excavation levels within the main block reveals a major difference between the 0-10 cm level and the 20-30 cm level (Table 8). As clearly defined in a frequency polygon which compares the assemblages by tool groups, the assemblages differ primarily in

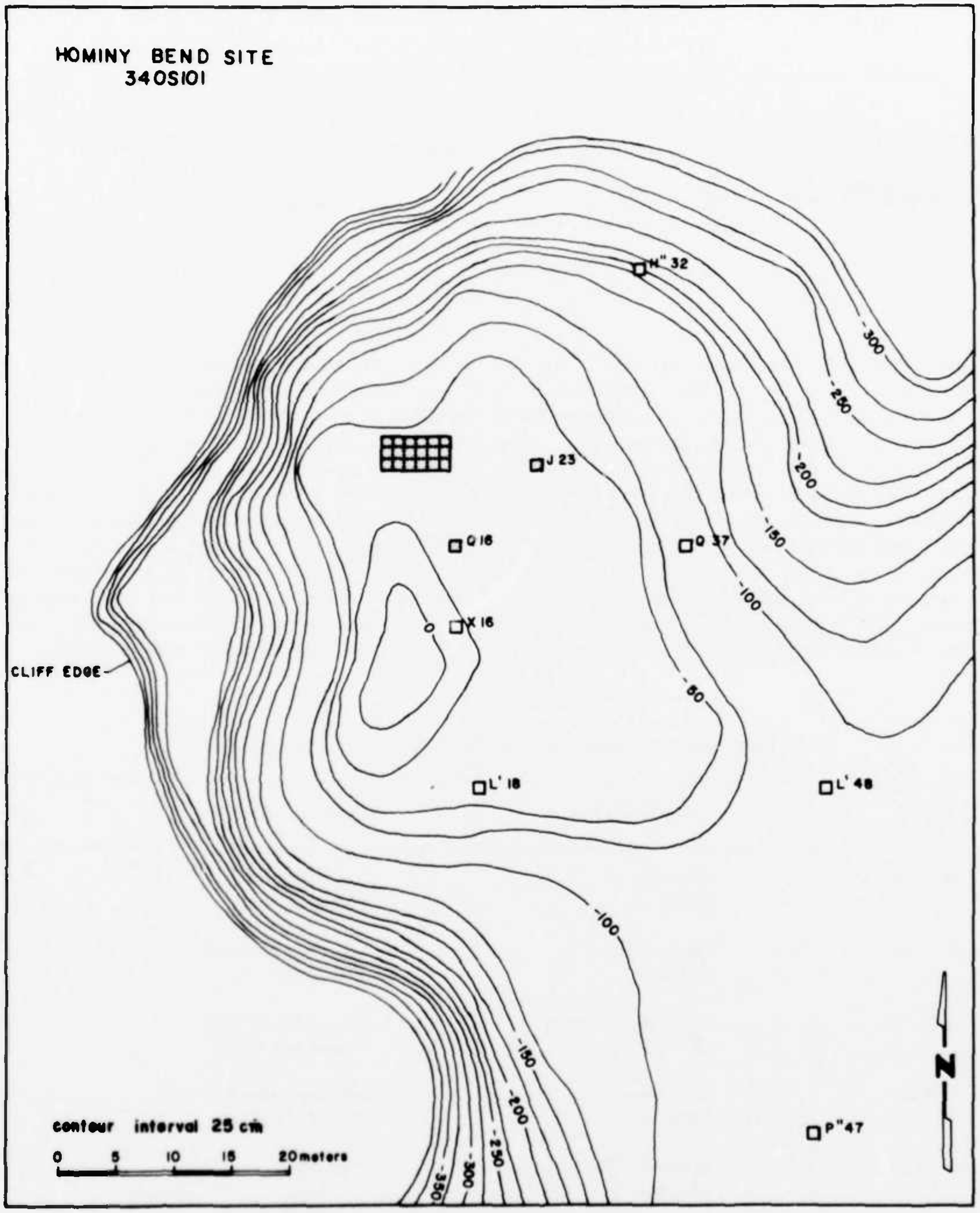


FIGURE 6: Site Map of the Hominy Bend Site (34OS101).

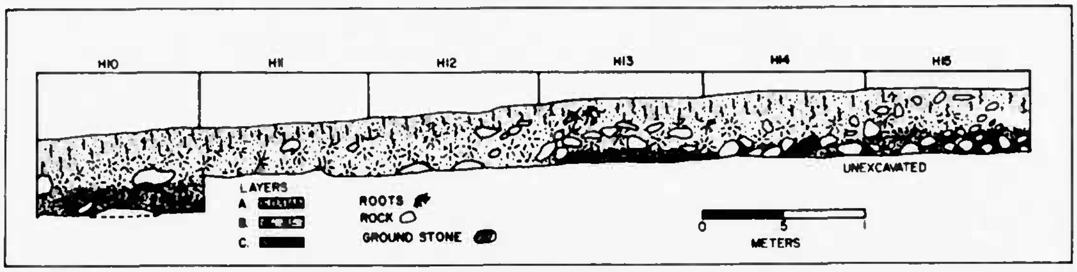


FIGURE 7: Stratigraphic Profile of Hominy Bend Site (34OS105).

respect to biface and point groups (Figure 8). The assemblage from the 0-10cm level contains a markedly higher frequency of points and lower frequency of bifaces than the assemblage from the 20-30cm level. Although the 10-20cm interval was subdivided into 10-15cm and 16-20cm levels in an attempt to define the cultural-historic break between the upper and lower levels, the tool samples of 17 and 16 specimens, respectively, are not really adequate to define assemblage tool group configurations. The combining of these samples into a 10-20cm interval would also fail to provide meaningful results due to the cultural hiatus within the interval.

Level I (surface - 10cm) contained some 48 tools represented by scraper, burin, notch, perforator, drill, biface, retouched element, and point groups. The scraper group includes 5 specimens of which all are end-scrapers. The group encompasses the distal ends of 2 broken scrapers, a small thumbnail scraper bearing slight inverse retouch, a small flake with raclette-like retouch, and a simple end-scraper with lateral obverse retouch (Figure 9:n). A single burin, represented by a dihedral burin on a snap, formed on the base of a large projectile point was recorded

TABLE 7

Description of Sediments from Hominy Bend Site (34OS101)

Level	Color, Hue/Chroma	Texture, Coherence	pH
0-10cm	Weak red 2.5YR 4/2	Silt, slight amounts of sand and clay	7.6
10-20cm	Dark brown 7.5YR 4/2	Silt, slight amounts of sand and clay	7.7
20-30cm	Dark reddish hrown 5YR 4/2	Silt, slight amounts of sand and clay	7.6
30-40cm	Dark brown 7.5YR 4/4	Silt, slight amounts of sand and clay	7.4
40-50cm	Reddish brown 5YR 4/4	Clay, silt	7.4
50-60cm	Brown 7.5YR 5/4	Clay, silt	7.3

TABLE 8

Tool Group Counts from the Main Block Excavation at Hominy Bend Site (34OS101)

Level cm	Scraper N	Scraper %	Denticulate N	Denticulate %	Notch N	Notch %	Burin N	Burin %	Perforator N	Perforator %	Drill N	Drill %	Retouched Piece N	Retouched Piece %	Knife N	Knife %	Biface N	Biface %	Dart N	Dart %	Arrow N	Arrow %	Point Biface N	Point Biface %	Multiple Varia N	Multiple Varia %	Total N
0-10	5	10.6			2	4.2	1	2.1	2	4.2	1	2.1	11	26.2	–	–	4	8.5	12	22.5	9	19.1	–	–	–	–	47
10-15	1	5.9	1	5.9	2	11.8	–	–	–	–	–	–	4	23.5	–	–	2	11.8	–	–	1	5.9	6	35.0	–	–	17
15-20	1	6.2			–	–	–	–	–	–	–	–	5	31.3	–	–	2	12.5	3	18.8	5	31.3	–	–	–	–	16
10-20*	2	4.5	1	2.3	3	6.8	1	2.3	–	–	–	–	11	25.0	–	–	4	9.0	4	9.0	8	18.2	10	22.7	–	–	44
20-30	3	6.3	–	–	2	4.2	–	–	2	4.2	1	2.1	15	31.3	–	–	12	25.0	13	27.1	–	–	–	–	–	–	48
30-40	2	13.3	–	–	–	–	–	–	1	6.7	–	–	1	6.7	–	–	7	46.7	1	6.7	–	–	3	20.0	–	–	15
Total	12	8.4	1	0.7	6	4.2	1	0.7	5	3.5	2	1.4	36	25.2	–	–	27	18.9	29	20.3	15	10.5	9	6.3	–	–	143

*Combined the 1976 10-20cm level with the 1978 10-15cm and 15-20cm levels.

(Figure 9:k). The notch group consists of 2 specimens: a multiple notch on a flake and a single notch located on the distal end of a flake (Figure 9:b). The perforator group contained 2 simple perforators formed by adjacent and intersecting retouched concavities (notches). A single drill bearing bifacial retouch was recorded (Figure 9:m). The distal end of the piece was recovered a little over 3 m from the proximal end at the same level. The biface group contains 4 fragments displaying bifacial retouch. These elements probably represent edge fragments of large points or bifacial knives. The retouched element group consists of 11 pieces of which all exhibit obverse retouch. Seven of the elements evince unilateral retouch, retouch (i.e., covering over 1/3 of an edge) is rare, with most of the tools displaying discontinuous retouch along straight or slightly convex margins. The point group constitutes the largest number of tools for the level with 21 specimens. As indicated in Table 10, large and small points are about equally represented. Of the 5 identifiable small points, Fresno (3) and Washita (2) (Figure 9:e,f) varieties were recorded. The large points were represented by 9 specimens exhibiting expanding stems (Figure 9:p,g,i), 2 specimens with contracting stems and 1 large point tip. Further examination of Table 9 reveals that point bases are four times more common than point tips and that broken specimens are more than twice as common as complete points.

Level II (10-15cm) contained 17 tools represented by scraper, denticulate, notch, retouch element, biface, arrow and point/biface groups. The scraper group included 1 specimen classified as a simple end-scraper. A simple denticulate on a secondary piece was recorded. The notch group consists of 2 specimens both single and on secondary pieces. The retouched element group consists of 4 pieces which all exhibit obverse retouch. Two bifaces were recovered, one of which is complete. One arrow point tip of an unknown type was recovered. Six bifacially worked fragments were classified within the point/biface group. The fragments were such that assignment to either of the point groups or the biface group was not possible.

Level III (15-20cm) contained 16 tools representing specimens of the scraper, retouched element, biface, dart, and arrow groups. The scraper group is represented by a single simple sidescraper made on a tertiary flake. The five retouched element specimens are all tertiary pieces and they exhibit normal obverse retouch. Bifaces are represented by 2 pieces one of which is only a fragment, and the other is a crudely worked piece likely in early stages of manufacture. The 2 point groups easily comprise the majority of the tools. Three specimens are classified as dart points with 2 being complete and typeable as expanding stemmed while the third is a basal fragment. The arrow points are represented by 5 specimens three of which are identifiable as to type while 2 are only tips. Two of the arrows are corner-notched Scallorns and the third is a broken side-notched Washita.

10-20cm* This level yielded only 11 tools including burin, notch, biface, retouched element, and point groups. A burin fabricated on a broken base of

*This level was excavated in 1976 and is combined with levels 10-15cm, and 15-20cm excavated in 1978 on Table 8.

TABLE 9

Tool Group Counts from the Test Units at Hominy Bend Site (34OS101)

Level cm	Scraper N	Denticulate N	Notch N	Burin N	Perforator N	Drill N	Retouched Piece N	Knife N	Biface N	Dart N	Arrow N	Point/ Biface N	Multiple/ Varia N	Total N
J23														
0-15	–	–	–	–	1	–	2	–	–	–	–	–	–	3
15-20	–	–	–	–	–	–	1	–	–	–	–	1	–	2
20-30	–	–	–	–	–	–	–	–	1	–	1	–	–	2
Total	–	–	–	–	1	–	3	–	1	–	1	1	–	7
X16														
0-10	1	–	–	–	–	–	–	–	–	–	–	2	–	3
10-15	–	–	–	–	–	–	–	–	–	–	1	–	–	1
20-30	–	–	1	–	–	1	1	–	–	–	–	1	–	4
Total	1	–	1	–	–	1	1	–	–	–	1	3	–	8
L18														
0-10	–	–	–	–	–	–	1	–	–	–	2	–	–	3
15-20	–	–	–	–	–	–	–	–	–	–	1	–	–	1
Total	–	–	–	–	–	–	1	–	–	–	3	–	–	4
Q16														
30-40	–	–	–	–	–	–	–	–	–	–	1	–	–	1
Total	–	–	–	–	–	–	–	–	–	–	1	–	–	1
Q37														
10-15	–	–	–	–	–	–	–	–	–	–	1	–	–	1
15-20	–	–	–	–	–	–	–	–	–	–	1	–	–	1
20-25	–	–	–	–	–	–	–	–	1	–	–	1	1	3
25-30	–	–	–	–	–	–	1	–	–	–	–	–	–	1
30-40	–	–	–	–	–	–	–	–	–	–	–	–	1	1
Total	–	–	–	–	–	–	1	–	–	–	–			
L'48														
10-15	–	–	–	–	–	–	–	–	1	1	1	–	–	3
15-20	–	–	–	–	–	–	–	–	–	–	1	–	–	1
Total	–	–	–	–	–	–	–	–	1	1	2	–	–	4
H'''														
0-10	–	–	–	–	–	–	1	–	–	–	–	–	–	1
Total	–	–	–	–	–	–	1	–	–	–	–	–	–	1
Test Pit Total	1	–	1	–	1	1	7	–	3	1	10	5	2	32
Grand Total	13	1	7	1	6	3	43	–	30	30	25	14	2	175

a large projectile point was recovered. The dihedral burin on a snap exhibits multiple facets at the juncture of the snap and the lateral edge of the piece (Figure 9:1). A single notch was recorded represented by a retouched concavity on a broken flake. Two bifacially flaked fragments, possibly representing edges of points were recovered. Retouched elements included two pieces retouched unilaterally along their obverse surfaces. The retouch on both pieces is discontinuous and forms slightly concave margins. Points encompassed 5 specimens including 2 small points (Washita and Haskell varieties), and a large expanding base point (Figure 9:h). In addition, a large point tip and large point base were recovered.

Level IV (20-30cm) contained 43 tools embracing scraper, notch, perforator, drill, biface, knife, retouched element, and point groups. Three scrapers were retrieved including a broken end-scraper displaying a very narrow working bit in conjunction

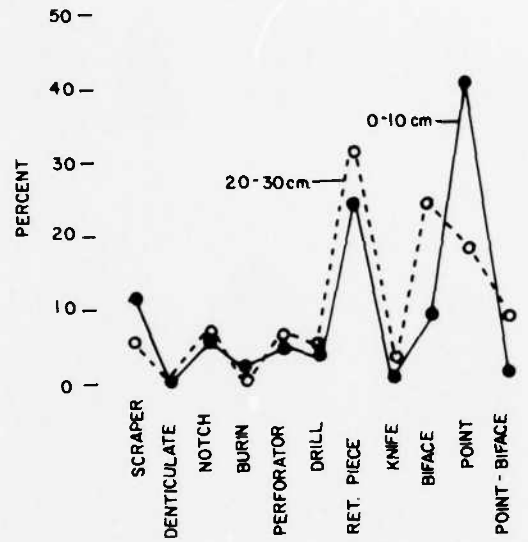


FIGURE 8. Frequency Polygon from Hominy Bend Site (34OS101).

with bilateral obverse retouch (Figure 9:c). Two notches were recorded, one of which was single and the other exhibiting multiple, steeply retouched concavities on opposing ends of the piece (Figure 9:o). Two perforators were recovered one being a simple, and the other a double perforator, formed at the intersection of a straight truncation with slightly concave bilaterally retouched edges (Figure 9:a). A single drill is represented by a broken bit measuring some 10mm in width. Twelve bifaces, consisting of fragments exhibiting bifacial retouch, were recorded. All the specimens were formed by continuous or discontinuous unilateral retouch. The point group included 13 dart group specimens, including 4 broken body sections, 2 tips, 2 expanding basal sections, 4 straight to slightly expanding bases, and an Edgewood variety (Figure 9:j).

Level V (30-40cm) contained 15 tools representing specimens of the scraper, perforator, retouched element, biface, dart, and point/biface groups. The scrapers are represented by a simple end-scraper of a secondary piece and a simple side-scraper on a secondary piece. The single example of a perforator is on a tertiary piece with abrupt retouch. The single retouched element is classified as normal continuous obverse retouch confined to one edge. The single dart point is represented only by a base and is therefore untypeable. The 6 bifaces are represented mainly by basal fragments. The point/biface category contains 3 specimens which include 2 tips and a mid-section which are not assignable to either the projectile point groups or the biface group.

Test Unit Tools (Table 9) a single simple end-scraper, a single notch, and a simple perforator as well as the broken bit of a drill, were the only representatives of these groups recovered in the test excavations. The 7 retouched elements were dominated by obverse unilateral specimens made mainly on tertiary elements. The biface group, was represented by 3 fragments. Only one specimen, a broken base, was collected from the test units that was assignable to the dart group, and it is untypeable. Of the 10 arrow point fragments recovered, 2 were typeable as Scallorn points with 2 other fragmentary bases possibly being Scallorns and the remaining 6 were too fragmentary to be typed. Five pieces were deemed questionable enough to be placed in the point/biface group.

Non-Tool Elements

Some 30,961 non-tool elements were recovered from the two seasons of excavation at the site, with 23,523 elements coming from the block area (Table 11, 12). The proportionate configuration of the assemblages according to non-tool element classes remain remarkably constant throughout the deposit although non-tool element density varies considerably (Table 11). Tertiary elements consistently dominate the assemblages and are followed in frequency by bifacial thinning, secondary, and primary elements. Only a single core was recorded out of over 30,000 elements.

The high frequency of tertiary elements in conjunction with the relatively high proportions of bifacial thinning elements reflect the emphasis which was placed upon the final stages of lithic processing at the site. Although the presence of cores, primary elements, and secondary elements denote initial processing activities, the low frequencies of these elements indicate that core preparation, decortification, and blank production were not stressed at the site.

An examination of the dimensions of non-tool elements reveals a reduction sequence which fol-

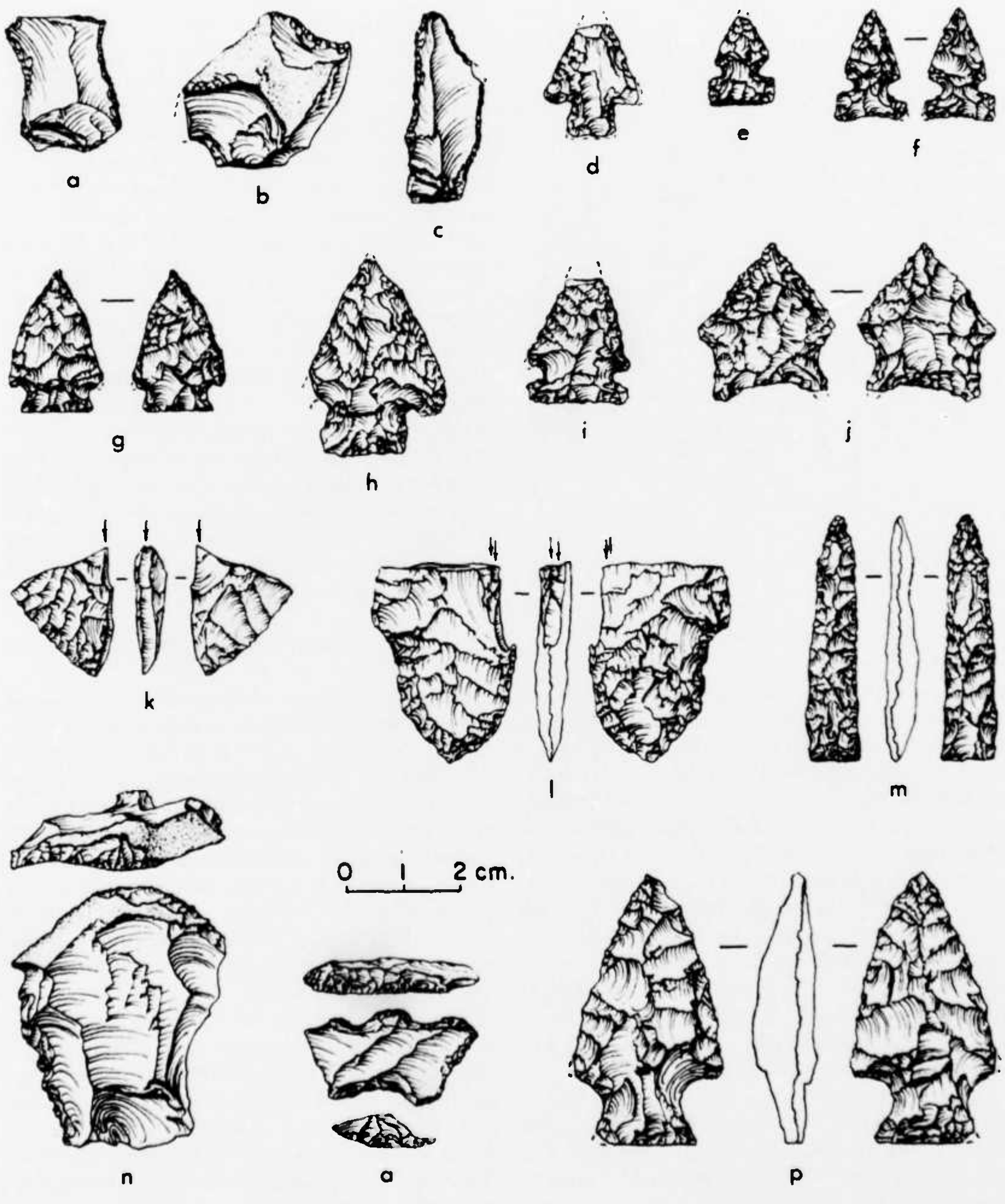


FIGURE 9: Selected Chipped Stone Tools from Hominy Bend Site (34OS101). Double perforator (a); notch (b); simple end-scraper (c); unidentified points (g, h, i); edgewood point (j); dihedral burins (k, l); drill (m); simple end-scraper (n); multiple notch (o); unidentified point (p).

TABLE 10

Point Attributed from Level I at the Hominy Bend Site.

Point Attribute	Point Section: Base	Complete	Tip	Total
Small point	1	–	2	3
Triangular and/or side-notched	3	3	–	6
Corner notched	–	–	–	0
Large point	–	–	1	1
Large point, expanding base	6	3	–	9
Large point, contracting base	2	–	–	2
Total	12	6	3	21

TABLE 11

Non-tool Element Densities, Counts, and Frequencies from the Main Block Excavation at Hominy Bend Site (34OS101)

Level*	Non-tool Density	Primary Element N	Primary Element %	Secondary Element N	Secondary Element %	Tertiary Element N	Tertiary Element %	Bifacial Thinning Element N	Bifacial Thinning Element %	Chunk N	Chunk %	Core N	Core %	Total N
1(0-10)	352.3	6	0.1	105	1.7	5,856	92.3	161	2.5	213	3.4	1	<0.1	6,342
2(10-15)	166.1	1	<0.1	48	1.7	2,618	95.5	65	2.4	9	0.3	–	–	2,741
3(15-20)	137.9	16	0.7	59	2.5	2,207	94.1	52	2.2	10	0.4	–	–	2,344
4(20-30)	435.5	15	0.2	140	1.8	7,423	94.6	193	2.5	68	0.9	–	–	7,839
5(30-40)	379.5	9	0.2	81	1.9	3,940	94.4	132	3.2	12	0.3	–	–	4,174
6(40-50)	48.0	–	–	2	4.2	44	91.6	–	–	2	4.2	–	–	48
7(50-60)	35.0	–	–	–	–	34	97.1	1	2.9	–	–	–	–	35
Total		47		435		22,122		604		314		1		23,523

*Levels 1, 4, 5, 6, 7 are 10 cm levels; levels 2 and 3 are 5 cm levels.

TABLE 12

Description of Tool and Non-tool Elements by Unit by Level of the Test Pits at Hominy Bend Site (34OS101).

Test Pit	J23		Q16		Q37		X16		L'18		L'48		L''47		H'''32	
Level	T	NT	T	NT	T	NT	T	NT	T	NT	T	NT	T	NT	T	NT
0-10cm	0	39	0	0	0	245	3	578	3	326	0	267	0	39	1	266
10-15cm	3	495	0	0	1	190	1	383	0	160	3	225	0	60	0	140
15-20cm	2	244	0	0	1	260	0	179	1	113	1	99	0	37	0	47
20-25cm	0	0	0	0	3	262	0	0	0	88	0	59	0	27	0	8
25-30cm	0	0	0	0	1	145	0	0	0	91	0	66	0	11	0	0
20-30cm	2	310	0	347	0	0	4	366	0	0	0	0	0	0	0	0
30-35cm	0	0	0	0	0	0	0	0	0	55	0	33	0	12	0	0
35-40cm	0	0	0	0	0	0	0	0	0	46	0	30	0	3	0	0
30-40cm	0	0	1	480	1	128	0	533	0	0	0	0	0	0	0	0
40-50cm	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0
Total	7	1068	1	827	7	1230	8	2039	4	885	4	779	0	189	1	421

lows the reduction order of the non-tool elements as based upon qualitative characteristics. Primary elements represent the largest elements followed in decreasing order by secondary, tertiary, and bifacial thinning elements (Table 13, Figure 10). A comparison of the dimensions of tools and non-tool elements indicates that the final fabrication of tools, tool maintenance, and tool rejuvenation were emphasized over tool production. The maximum thicknesses of spalls trapped between 4mm and 10mm mesh are considerably less than the thicknesses produced by percussion or pressure loads experimentally (Table 14). The thicknesses, however, more closely approximate the thicknesses of pressure than percussion derived spalls.

Raw Material: Chert Varieties

Of the five chert varieties employed in the chipped stone industry, Florence and Keokuk cherts were the most commonly used (Table 15). The frequency distribution of chert varieties, as manifested by non-tool elements, reveals diachronic trends in chert utilization. Florence chert declined in usage through time, while Keokuk chert increased in utilization during the occupation of the site. Interestingly enough, tools display chert frequency distributions which differ from the pattern presented by non-tool elements. Although the lack of agreement between the chert distributions of tools and non-tool elements may be an expression of different sample sizes, the dissimilar distributions may reflect differences in curation modes and reduction of raw material when introduced to the site. If, for example, Florence chert had been reduced more extensively than Keokuk chert, perhaps into blanks and tools, before utilization at the site, then one would expect that Florence chert would exhibit a lower tool to non-tool ratio than Keokuk chert. Regardless of stratigraphic position and the attendant changes in the relative proportions of chert usage by variety, the greater proportion of Florence chert appears in the form of tools, while the larger proportion of Keokuk occurs as non-tools. Apparently, Florence chert was being curated to a greater extent than Keokuk chert.

In respect to raw material it is noteworthy that some 4 obsidian flakes were recovered from the 15-30cm and the 10-20cm levels of the block area during the two seasons of excavation. These specimens are presently being analyzed for their trace element composition along with reference specimens from Wyoming and New Mexico obsidian flows.

Pottery Specimens

Two pottery sherds were recoverd from the 10-15cm horizon. The body sherds represent a rather thick (20mm and 22mm) shale tempered ware with

TABLE 13

Dimensional Data on Unbroken Tools and Non-tool Elements from Hominy Bend Site (34OS101)

	N	Length/mm $\bar{X}$	Length/mm S.D.	Width/mm $\bar{X}$	Width/mm S.D.	Thickness/mm $\bar{X}$	Thickness/mm S.D.
Level 1 (0-10cm)*							
Tools							
Primary	1	17.0	0.0	21.0	0.0	4.4	0.0
Secondary	8	13.4	4.3	13.0	3.3	2.1	0.8
Tertiary	158	7.6	3.6	7.2	3.6	1.1	0.7
Bifacial thinning	40	8.9	4.6	7.9	3.7	1.4	1.0
Level 2 (10-15cm)							
Tools	5	37.2	17.5	18.6	6.2	7.0	3.7
Primary	1	10.0	0.0	10.0	0.0	1.6	0.0
Secondary	19	7.2	4.1	8.1	4.4	1.6	1.5
Tertiary	324	5.4	2.9	5.0	3.2	0.7	0.5
Bifacial thinning	54	5.9	2.9	6.9	11.0	0.9	0.5
Level 3 (15-20)							
Tools	6	31.5	12.5	17.3	5.5	5.5	3.2
Primary	2	16.0	8.5	14.5	9.2	2.4	0.1
Secondary	16	8.8	4.3	9.3	5.6	1.5	1.0
Tertiary	309	5.8	2.8	5.3	2.9	1.0	1.4
Bifacial thinning	31	7.5	4.8	6.5	3.8	1.1	0.9
Level 4 (20-30)							
Tools	1	27.0	0.0	21.0	0.0	5.4	0.0
Primary	3	13.3	7.6	11.3	4.5	2.2	1.6
Secondary	33	11.0	6.7	10.5	7.3	2.2	1.9
Tertiary	556	6.9	3.5	6.0	2.6	0.8	0.6
Bifacial thinning	106	7.1	5.8	6.3	3.3	1.1	0.6
Level 5 (30-40)							
Tools	1	23.0	0.0	24.0	0.0	4.9	0.0
Primary	4	7.5	1.9	9.3	1.7	1.7	0.1
Secondary	23	10.0	7.7	8.8	4.1	1.6	1.2
Tertiary	573	7.1	3.5	6.3	3.2	0.9	0.5
Bifacial thinning	105	7.6	3.8	7.0	3.5	1.1	0.5
Level 6 (40-50)							
Tertiary	11	7.1	3.4	6.4	3.6	1.0	0.4
Level 7 (50-60)							
Tertiary	6	6.0	1.5	6.2	2.3	0.8	0.5
Bifacial thinning	1	9.0	0.0	7.0	0.0	1.6	0.0

*A random sample was taken from the 1976 field season non-tool elements.

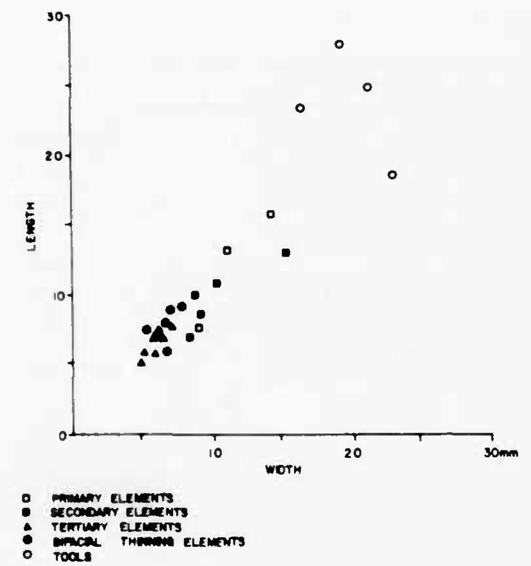


FIGURE 10: Dimensional Scattergram Comparing Unbroken Non-tool Elements and Tools from Hominy Bend Site (34OS101).

smooth brown (7.5 YR 5/4) exteriors and polished dark brown (7.5 YR 4/4) interiors. The sherds display uneven firing and considerable weathering of their surfaces. One of the specimens, however, has a crudely brushed exterior. The interiorly polished surfaces imply that the sherds are, most probably, remnants of a bowl.

Groundstone Specimens

A quartzite cobble hammerstone was recovered from level 4 (30-40cm) within the main excavation block. Extensive battering is evident on one end of the piece with slight picking on the opposite end. The piece measures 60 x 40 x 34mm.

An incomplete mano, measuring 105 x 90 x 54mm, was recovered from level 3 (20-30cm). The rectanguloid piece displays smoothed and squared lateral edges, and both faces are ground although one face is broken. The specimen is burned.

Three pieces were recovered from three test pits. From TP L18 15-20cm depth came a burned sandstone grinding slab fragment smoothed on one face. This central portion measures 77 x 70 x 27mm. A ground unburned sandstone fragment smoothed on one face and measuring 82 x 70 x 21mm was recovered from TP32 20-25cm depth. An incomplete rectangular grinding slab with squared sides was found in TP Q37 30-40cm depth. The specimen exhibits a depression on one face which measures 85 x 55mm and is approximately 10mm deep. The other face also is smoothed. The dimensions of this unburned piece are 170 x 100 x 40mm.

Daub and Ochre

A few specimens of daub were recovered in the block excavation from the 0-10cm and the 20-30cm levels. Ochre specimens, all unmodified, were collected from the 0-10cm level within the block excavation.

Intra-site Distributions

The intensities of the occupations of the site appear to have fluctuated as reflected in the differences in artifact densities (Table 10). The 0-10cm, 20-30cm, and 30-40cm levels display peak densities, while the 10-20cm level exhibits a marked decline in artifact density. Below 40cm the artifact densities decrease dramatically and probably represent sterile sediments with a few intrusive elements.

The horizontal distribution of artifacts, particularly non-tool elements, indicate that the northern end of the ridge toe near its crest was the major zone of habitation throughout the prehistoric occupation of the site. Although the test pits located on the southern portion of the ridge yielded artifacts, they occurred in lower densities. Apparently, the prominent flat area adjacent to Hominy Creek was viewed as the ideal location for an encampment.

Cultural-Historical Affiliations

The cultural-historic designation for the site is based primarily upon diagnostic artifacts with limited supportive information coming from geologic evidence. As previously indicated, a radiometric date from the 20-30cm interval will be available shortly.

The presence of numerous triangular-notched (Washita) and unnotched (Fresno) points confirms a Plains Village Period occupation for the 0-10 cm level.

TABLE 14

Comparison of Mean Maximum Thicknesses from the Main Block at Hominy Bend Site (34OS101) and Experimentally Produced Spall Samples Trapped Between 4 and 10mm Sieves.

Level	Non-tool Element	N	Thickness/mm X	S.D.
1	Tertiary Element	39	0.7	0.2
	Bifacial Thinning	6	0.8	0.2
2	Secondary Element	5	0.7	0.4
	Tertiary Element	208	0.5	0.2
	Bifacial Thinning	27	0.7	0.2
3	Secondary Element	3	0.6	0.2
	Tertiary Element	177	0.5	0.2
	Bifacial Thinning	18	0.9	0.4
4	Secondary Element	6	0.8	0.3
	Tertiary Element	227	0.7	0.7
	Bifacial Thinning	40	0.8	0.3
5	Secondary Element	7	0.6	0.2
	Tertiary Element	219	0.6	0.2
	Bifacial Thinning	28	0.9	0.4
6	Tertiary Element	2	0.7	0.2
[illegible]	Tertiary Element	1	0.9	0.0
Experimental Spalls	Hard-hammer	61	2.08	1.00
	Soft-hammer	61	1.87	0.43
	Pressure	61	1.29	0.26

The 10-20cm interval apparently contains a transition from Plains Village to Plains Woodland horizons between 10-15cm, and an Archaic Period occupation beneath 15cm. Although 2 side-notched points, diagnostic of a Plains Village time-frame, were recovered from the 10-20cm interval during the 1976 season, the point varieties retrieved during the 1978 field season, from the 10-15cm interval, were restricted to Woodland Period varieties of small corner-notched specimens. The limited ceramic evidence is also more suggestive of the local Woodland Period plain ware, which contains a variety of tempering materials, than the local Plains Village Period shell tempered wares.

The stratigraphic position of the 10-15cm horizon is also in concert with the stratigraphic settings of other open-air Woodland occurrences in the Verdigris drainage basin where Woodland occupations rest on an upland red paleosol (Keyser and Farley, 1979:59-60).

The recovery of large expanding stemmed points, including Lang (Bell, 1958:36-37) and Edgewood (Bell, 1958:20) varieties, beneath 15cm in conjunction with a single small point and absence of pottery suggests late Archaic affiliation. The proposed Archaic time-frame is consistent with the geologic setting within the red paleosol. A forthcoming radiocarbon determination from the 10-20cm level should provide a means of evaluating this proposal.

TABLE 15

Raw Material Varieties from Hominy Bend Site (34OS101).

	N	Florence %	Foraker %	Keokuk %	Tahlequah %	Neva %	Other %	Heat-treated %
Level 1 (0-10cm)*								
Tools	33	55.0	10.0	35.0	–	–	–	48.0
Non-tools	4164	15.0	3.0	79.2	0.6	1.8	–	44.2
Level 2 (10-15cm)								
Tools	17	35.3	5.9	47.1	–	11.8	–	52.9
Non-tools	2741	12.4	2.6	80.3	1.2	3.5	–	54.9
Level 3 (15-20)								
Tools	16	25.0	6.3	50.0	–	–	18.8	50.0
Non-tools	2344	22.8	3.3	69.8	1.4	2.7	–	48.3
Level 4 (20-30cm)								
Tools	31	38.7	–	45.2	–	9.7	6.5	58.1
Non-tools	4576	31.8	2.4	57.7	5.4	2.7	–	50.9
Level 5 (30-40cm)								
Tools	15	53.3	13.3	20.0	–	–	13.3	80.0
Non-tools	4011	35.6	2.6	53.8	4.9	3.1	–	52.1
Level 6 (40-50)								
Tools	1	100.0	–	–	–	–	–	100.0
Non-tools	48	25.0	–	75.0	–	–	–	40.0
Level 7 (50-60)								
Tools	0	–	–	–	–	–	–	–
Non-tools	36	27.8	–	63.9	–	8.3	–	55.6

*A sample of at least 50% of non-tool elements recovered from level 1 during the 1976 field season were selected for raw material typing; all tools were examined for raw material typing in 1976.

The Williams Site (34OS160)

The site, situated on the north side of Hominy Creek, rests on the floodplain within a wide northernly loop of the tributary. Artifacts, recovered from excavation and the surface, are distributed over some 20,000 sq. m. within a zone which follows the edge of a ridgetoe and runs roughly parallel to Hominy Creek upstream from where the channel makes a northernly meander (Figure 11). The western half of the site is constricted between the flanks of the ridge and the modern channel, while the eastern section of the site displays a much wider north-south distribution which corresponds to the widening of the floodplain within the meander loop. The western portion of the site is presently covered by tall grass and trees, while the eastern section is under cultivation.

The Williams Site was discovered and initially investigated in 1974 (Gettys, Layhe, and Bobalik, 1976). Five test pits and a block excavation, confined to the western portion of the site, revealed a deep cultural deposit attributed to Plains Woodland Period occupations.

Subsequent to the initial investigation, the site was recommended for additional study with the antiquity, duration of occupation, and activities of the site mentioned as primary topics for further inquiry (Gettys, Layhe, and Bobalik, 1976:57). In developing the excavation strategy for the Phase II investigation of the Williams Site, these recommendations were integrated with the other goals common to the project. The fundamental tasks within the excavation plan included: (1) establishing the area and depth of the site; (2) correlating the stratigraphy of the site with the alluvial history of the valley; and (3) recovering material suitable for obtaining radiometric dates. Although the accomplishment of these tasks was not viewed as a final goal, it was seen as requisite to addressing some of the more complex questions pertaining to the prehistoric occupations of the site.

The excavation of numerous test pits in conjunction with the intensive controlled surface collection of the cultivated portion of the site resulted in the definition of the actual limits of prehistoric occupation on all but the western margin of the site. The site covers an extremely large area in excess of 20,000 sq. m. The northern edge of the site is defined by the base of the ridge, while the eastern and southern limits are associated with the low swell emanating from the ridge onto the floodplain and the modern channel.

The excavation of the test pits and stratigraphic trenches revealed an unusually thick cultural deposit over most of the site. The test pits excavated in the cultivated areas of the site yielded artifacts from well under the plough zone. Controlled excavations recovered artifacts from up to a meter in depth, while a stratigraphic trench just south of the block area produced an artifact from over 3m in depth.

The stratigraphy of the site was primarily defined through the excavation of a backhoe trench running north and upslope from the northeast corner of the block excavation. Not only is the geologic interpretation of the site important in understanding the local environment during occupation, but it is also critical to accurately placing the site in the alluvial sequence of the valley. A description and discussion of the stratigraphy of the site and its correlation to the geology of the valley follow within this and other sections of the report.

Particular attention was paid to the presence of

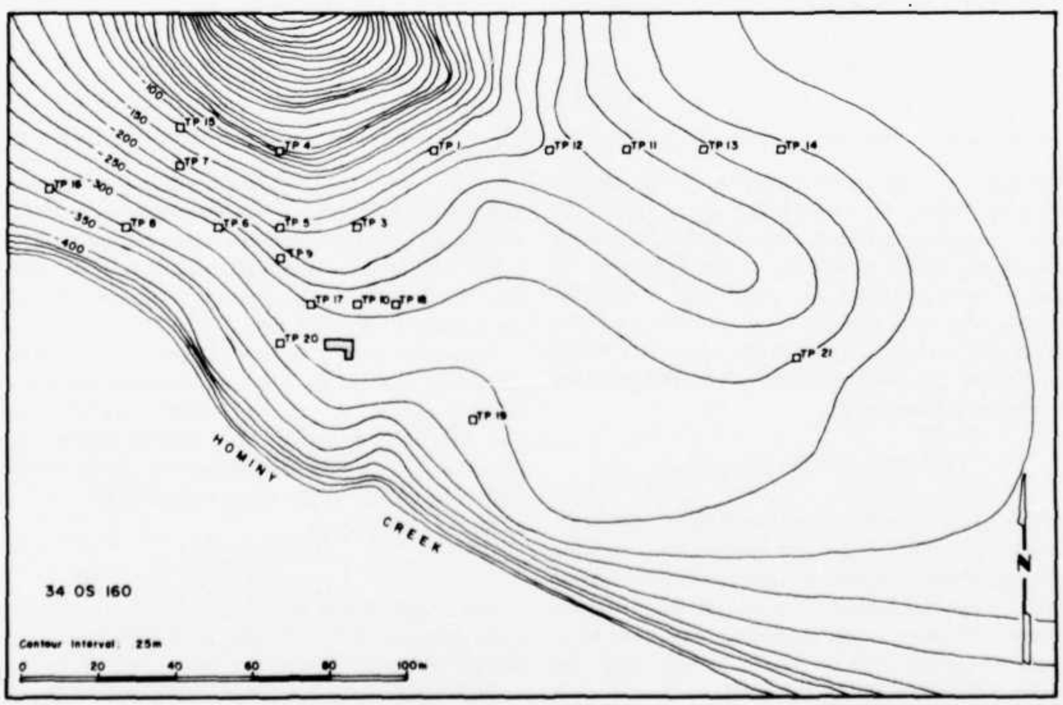


FIGURE 11: Site Map of the Williams Site (34OS160).

TABLE 16

Description of Sediments from the Williams Site (34OS160).

Sample	Thickness	Color, Hue/Chroma	Texture, Coherence	pH
1	20-30cm	Brown 7.5YR 4/2	Sandy silt, soft	7.1
2	30-40cm	Brown 7.5YR 4/2	Sandy silt, soft	7.3
3	40-50cm	Dark brown 7.5YR 3/2	Sandy silt, soft	7.2
4	50-60cm	Dark grayish brown 10YR 4/2	Sandy silt, soft	7.1
5	60-70cm	Dark grayish brown 10YR 4/2	Sandy silt, soft	7.2
6	70-80cm	Grayish brown 10YR 5/2	Sandy silt, soft	7.2
7	80-90cm	Grayish brown 10YR 5/2	Sandy silt, soft	7.2
8	90-100cm	Brown 10YR 5/3	Sandy silt, soft	7.4
9	100-110cm	Brown 10YR 5/3	Sandy silt, soft	7.4

charred materials in an effort to obtain datable samples. When charcoal flecks were noted, the matrix associated with the flecks was collected for processing in the laboratory at the University of Tulsa. As a result of this procedure, a charcoal sample was secured from level 7 within a column excavated in the south wall of the block excavation, labeled the "hearth excavation". The date from the sample is forthcoming.

Description of the Excavation

The general methodology employed in the excavation was consistent with that defined for the project. Some 21 test pits were placed across the site in a non-random fashion. The test pits were roughly positioned along north-south and east-west transects in an attempt to obtain stratigraphic and artifact distributional information.

In an attempt to obtain adequate artifact samples, test pits were placed in the midst of surface "concentrations" when such artifact clusters were recognized. Even with this attempt to increase subsurface artifact recovery, the samples were still quite small. It is noteworthy that although some 21 test pits were excavated, the investigation represents only .1% of the surface area of the site.

A backhoe trench, approximately 50m long, was placed along a line from the northeast corner of the block excavation through the western margins of test pits 10 and 3. A shorter stratigraphic trench was continued along this north-south line for approximately 7m south of the excavation block.

Stratigraphy

Two major stratigraphic layers were revealed by the excavation of test pits and stratigraphic trenches at the Williams Site: (1) a lower unit of red to reddish yellow very fine quartz sand capped by a red paleosol; and (2) an upper unit of brown to grayish brown sandy silt. With the exception of the flakes

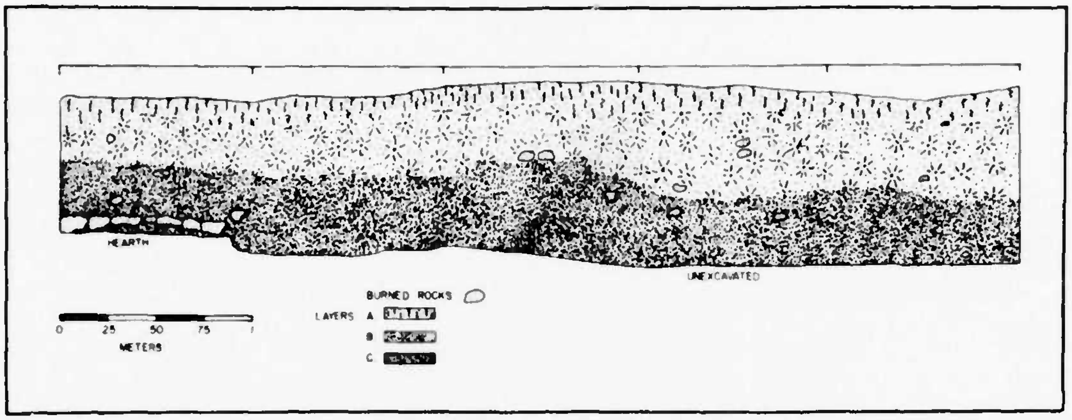


FIGURE 12: Stratigraphic Profile of the Williams Site (34OS160).

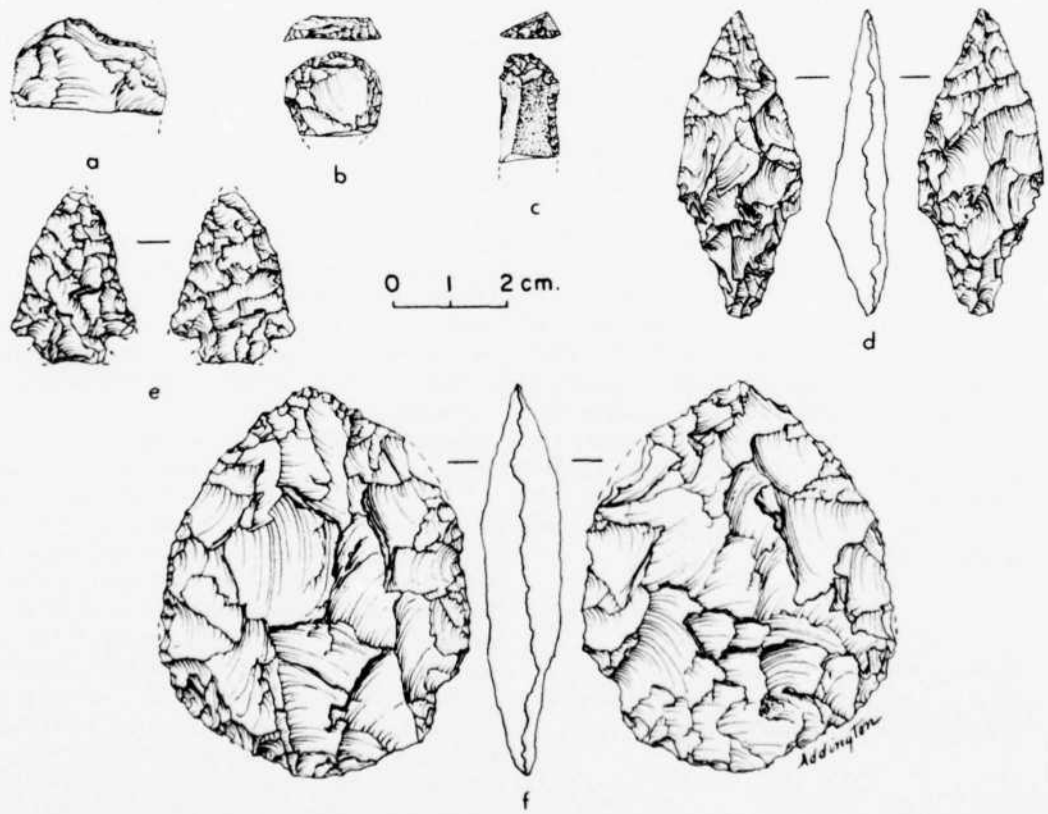


FIGURE 13: Selected Chipped Stone Tools from the Williams Site (34OS160). *a*-flake with continuous, normal, unilateral, obverse retouch, *b*, *c*-end-scrapers represented by distal working bits, *d*-Gary point, *e*-Ensor point, *f*-large symmetrical ovate biface.

TABLE 17

Tool Groups Counts from the Williams Site (34OS160).

	Scraper	Denticulate	Notch	Perforator	Drill	Retouch Piece				Arrow	Point/ Biface	Multipurpose/ Varia	Total
Surface	1	0	0	0	0	4	0	0	4	2	0	0	11
Test Pit 7													
10-20cm	0	0	0	0	0	0	0	0	0	0	1	0	1
Test Pit 8													
20-30cm	0	0	0	0	0	0	0	0	0	1	0	0	1
Test Pit 19													
0-30cm	0	0	0	0	0	1	0	0	0	1	0	0	2
50-60cm	0	0	0	0	0	0	0	0	0	0	1	0	1
Test Pit 20													
0-10cm	0	0	0	0	0	1	0	0	0	0	0	0	1
10-20cm	0	0	0	0	0	2	0	0	1	0	0	0	3
40-50cm	0	0	0	0	0	1	0	1	0	0	1	0	3
Hearth Excavation													
0-10cm	0	0	0	0	0	1	0	0	0	0	0	0	1
10-20cm	0	0	0	0	0	0	1	0	0	0	0	0	1
40-50cm	1	1	0	0	0	0	0	0	0	1	0	0	3
Total	2	1	0	0	0	10	1	1	5	5	3	0	28

found in test pit 7, all of the cultural material was confined to the upper alluvial unit.

Although the upper alluvial unit is lithological homogeneous, stratigraphic differences occur in respect to color and hue (Table 16). These differences appear to be related to cultural as opposed to geologic factors. A dark grayish brown layer (Layer B) displays heavy organic stain and contains a higher density of dispersed charcoal flecks than the overlying and underlying layers (Figure 12). It is noteworthy that layer B also corresponds to a peak in artifact density.

Recovered Artifacts

Artifacts recovered during excavation were restricted to chipped stone and ground stone specimens with the former predominating.

Chipped Stone Tools

Only 28 tools were recovered from the investigation of the Williams Site with 11 of these coming from the surface collection. Due to the small sample the tools are described as a single assemblage with provenience information presented in Table 17. Although the sample is too small to define stratigraphic trends, if they exist, the assemblage as a whole is dominated by retouched pieces and points as these 2 classes constitute over 75% of the assemblage.

Scrapers consisted of 2 specimens; both end-scrapers represented by distal working bits (Figure 13:b and c). A single denticulate was recorded with the specimen exhibiting abrupt retouch opposite the denticulated edge. Retouched pieces constituted the largest class with 11 specimens. These included 6 flakes with normal discontinuous retouch on obverse surfaces, a broken flake bearing marginal bifacial retouch, a piece with normal inverse retouch, and 2 specimens bearing fine obverse retouch along lateral margins. A single knife was recorded with acute overlapping retouch along a straight lateral edge. A large symmetrical ovate biface was also recovered (Figure 13:f). Three dart points were found, consisting of 2 Gary points (Figure 13:d) and an Ensor point (Figure 13:e) in addition to a blade and a base of unclassified varieties. Arrow points included the

TABLE 18

Non-tool Element Densities, counts, and Frequencies from the Williams Site (34OS160). Density is based on number of elements/0.1 cu m of excavated fill.

Level	Non-tool Density*	Primary Element N	Primary Element %	Secondary Element N	Secondary Element %	Tertiary Element N	Tertiary Element %	Bifacial Thinning Element N	Bifacial Thinning Element %	Chunk N	Chunk %	Total N
1	23.2	–	–	–	–	29	100.0	–	–	–	–	29
2	15.7	–	–	–	–	55	93.2	4	6.8	–	–	59
3	18.7	–	–	1	1.4	65	92.9	4	5.7	–	–	70
4	13.2	1	1.5	1	1.5	62	94.0	2	3.0	–	–	66
5	21.1	–	–	1	1.4	68	91.8	5	6.8	–	–	74
6	26.8	–	–	–	–	96	89.7	10	9.3	1	.9	107
7	36.3	–	–	2	1.4	137	94.5	5	3.4	1	.7	145
8	8.8	–	–	–	–	31	93.9	1	3.0	1	3.0	33
9	6.0	–	–	–	–	18	100.0	–	–	–	–	18
10	1.0	–	–	–	–	1	100.0	–	–	–	–	1
Total		1		5		562		31		3		602

*Test pit #7 omitted; test pits 14, 19, and 21 0-30cm not figured into density; test pit 19 30-50cm not figured into density; hearth excavation feature 3 figured separately (see Table 0).

bases of 2 Scallorn points and the tip of a small point. Three bifacial fragments were also recovered.

Non-Tool Elements

Some 1,112 non-tool elements were recovered from the test excavations excluding test pit 7 (Table 18, 19). In that the 29 non-tool elements recovered from test pit 7 were found within the red paleosol, thus predating the artifactual material collected from the other units, these specimens were excluded from computation.

The hearth excavation and the other test pits display similar configuration of non-tool elements according to the proportionate representation of classes, although the hearth excavation has considerably higher densities of artifacts (Table 19). Tertiary elements dominate the non-tool assemblage with normally lower frequencies of bifacial thinning, secondary, and primary elements. Cores were not recorded from the excavations or from the surface concentrations. Although initial processing activities must have taken place at the site, final processing activities related to tool fabrication, maintenance, and rejuvenation must have been emphasized by the prehistoric inhabitants. The marked size differences between tool and non-tool elements implies that few of the non-tool elements could have served as blanks for tool manufacture (Table 20, Figure 14).

Raw Material

Florence and Keokuk cherts were utilized far more extensively than the other chert varieties identified at the site (Table 21). A comparison of the frequencies of occurrence of Florence and Keokuk cherts reveals an inverse correlation, for Florence chert declines through time in concert with an increase in usage of Keokuk Chert.

Groundstone Specimens

Nineteen groundstone artifacts and one hammerstone were recovered from Site 34OS160. All but four small sandstone fragments were collected from the surface of the site, which had been plowed. The surface artifacts are described first.

TABLE 19

Non-tool Counts and Frequencies from the Williams Site (34OS160) Hearth Excavation.

Level	Primary Element N	Primary Element %	Secondary Element N	Secondary Element %	Tertiary Element N	Tertiary Element %	Bifacial Thinning Element N	Bifacial Thinning Element %	Total N
1	–	–	–	–	4	100.0	–	–	4
2	–	–	–	–	3	100.0	–	–	3
3	–	–	–	–	14	93.3	1	6.7	15
4	–	–	–	–	60	100.0	–	–	60
5	1	1.5	2	3.0	61	91.0	3	4.5	67
6	–	–	–	–	72	100.0	–	–	72
7	–	–	1	1.4	69	97.2	1	1.4	71
8	–	–	–	–	70	100.0	–	–	70
9	–	–	2	2.8	66	93.0	3	4.2	71
10	–	–	1	2.1	45	95.7	1	2.1	47
11	–	–	1	3.3	29	96.7	–	–	30
Total	1		7		493		9		510

Surface Material

A complete oval symmetrical limestone mano measuring 150 x 105 x 43mm displays smoothing on one face. The lateral boundaries are pecked or battered. Plow marks are evident on the ground surface of the piece. The "corner" of an oval or rectangular piece measuring 70 x 55 x 38mm was fabricated of unburned sandstone. One face and an adjacent side are smoothed in a continuous arc.

A "nutting stone" of unburned sandstone displays a circular depression measuring 30 x 30 and 9mm deep. The remaining edges of the broken piece are rounded; the remaining dimensions are 110 x 75 x 35mm.

A rectangular unburned sandstone specimen displays a groove on a smoothed surface. The shallow ground measures 71 x 17mm. Overall dimensions are 115 x 70 x 41mm.

An irregular quartzite cobble and hammerstone measuring 80 x 60 x 49mm displays pecking on the wider end.

Thirteen fragments of groundstone artifacts were also recovered from the surface of the site. None is large, and most probably these are fragments of grinding slabs. Only two of the thirteen fragments are burned; the others are unburned sandstone. Eight exhibit smoothing on 1 face, the others on both faces. Two pieces are from the edge of a slab; the others are center portions of irregular shape. Variation in thickness and other characteristics indicates at least five specimens.

Intra-Site Distribution

The vertical distribution of artifacts, as defined by non-tool elements, appears to increase in density from the first 10cm below surface to about 70cm below surface and then decrease in density with greater depth. The horizontal distribution of non-tool elements denotes an area of high density in the vicinity of test pits 19, 20 and the hearth excavation within the main area.

Features

The test pits and the walls of the main excavation revealed burned sandstone concentrations at depths ranging from 20cm to a meter. The concentrations were generally one stone thick and were not associated with depressions or pits, but defined regular nearly flat surfaces. Within the region, such features have an association with Plains Woodland Period encampments.

TABLE 20

Dimensional Data Unbroken Tools and Non-tool Elements from the Williams Site (34OS160).

	N	Length/mm $\overline{X}$	Length/mm S.D.	Width/mm $\overline{X}$	Width/mm S.D.	Thickness/mm $\overline{X}$	Thickness/mm S.D.
Level 1							
Tertiary	10	8.5	4.4	7.7	3.5	1.5	1.0
Level 2							
Tertiary	20	8.5	3.8	7.6	3.1	1.1	0.8
Bifacial thinning	4	7.5	1.0	8.0	1.4	1.2	0.3
Level 3							
Tool	1	29.0	0.0	12.0	0.0	4.4	0.0
Tertiary	22	5.9	1.7	5.5	1.9	0.9	0.5
Bifacial thinning	4	6.8	3.9	6.0	3.8	1.0	0.2
Level 4							
Primary	1	9.0	0.0	15.0	0.0	2.8	0.0
Tertiary	27	6.3	2.6	6.7	2.9	1.0	0.4
Bifacial thinning	2	11.0	2.8	14.5	0.7	2.1	0.6
Level 5							
Tertiary	26	6.4	2.8	6.5	3.4	1.0	0.6
Bifacial thinning	5	7.0	3.6	6.2	4.3	0.9	0.4
Level 6							
Tertiary	24	6.2	3.0	6.4	3.3	0.8	0.5
Bifacial thinning	10	5.3	1.4	5.5	2.0	0.8	0.1
Level 7							
Secondary	1	4.0	0.0	5.0	0.0	0.4	0.0
Tertiary	26	6.0	2.6	5.8	3.5	0.9	0.5
Bifacial thinning	4	7.0	4.1	6.8	3.9	0.9	0.4
Level 8							
Tertiary	14	6.8	2.9	5.4	3.1	0.8	0.3
Bifacial thinning	1	5.0	0.0	6.0	0.0	0.8	0.0
Level 9							
Tertiary	5	6.2	2.7	4.6	4.0	0.7	0.3

TABLE 21

Raw Material Varieties from 34OS160*

	N	Florence %	Foraker %	Keokuk %	Tahlequah %	Neva %	Other %	Heat-treated %
Level 1								
Tools	1	100.0	–	–	–	–	–	100.0
Non-tools	29	24.1	3.4	65.5	–	–	–	58.6
Level 2								
Tools	2	50.0	–	50.0	–	–	–	50.0
Non-tools	66	28.8	–	68.1	–	3.0	–	50.0
**Level 3								
Tools	3	33.3	–	66.7	–	–	–	33.3
Non-tools	140	21.4	–	75.0	–	2.1	1.4	47.9
***Level 4								
Tools	0	–	–	–	–	–	–	–
Non-tools	99	32.3	–	60.6	2.0	3.0	2.0	42.4
****Level 5								
Tools	2	–	–	100.0	–	–	–	100.0
Non-tools	158	28.5	–	68.4	0.6	0.6	1.9	50.6
Level 6								
Tools	1	–	–	100.0	–	–	–	100.0
Non-tools	107	29.9	0.9	68.2	–	–	0.9	50.5
Level 7								
Tools	0	–	–	–	–	–	–	–
Non-tools	166	43.4	–	56.0	0.6	–	–	68.1
Level 8								
Tools	0	–	–	–	–	–	–	–
Non-tools	33	33.3	3.0	60.0	–	3.0	–	48.5
Level 9								
Tools	0	–	–	–	–	–	–	–
Non-tools	18	61.1	–	33.3	5.6	–	–	66.7
Level 10								
Tools	0	–	–	–	–	–	–	–
Non-tools	1	–	–	100.0	–	–	–	100.0

*Hearth excavation feature 3 excluded
**Test pits 19 and 21, 0-30cm level included
*Test pits 1-5, 0-40cm level included
****Test pit 19, 30-50cm level included

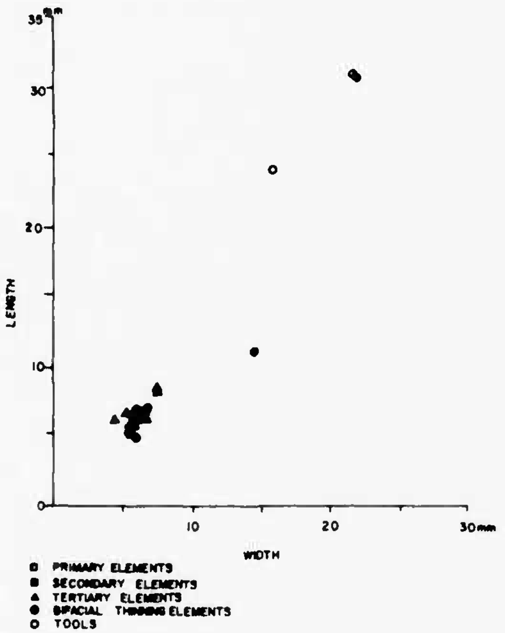


FIGURE 14: Dimensional scattergram comparing unbroken non-tool elements and tools from the Williams Site (34OS160). Data points represent mean dimensions by level for the various artifact classes.

Cultural-Historical Affiliation

The initial evaluation of the antiquity of the site as being Plains Woodland in age appears to be correct. A Plains Woodland designation is supported by artifactual and geologic evidence. The recovery of dart points (Gary and Ensor varieties) in association with corner-notched arrow points (Scallorn) suggests a Plains Woodland affiliation as opposed to Archaic Period occupation. Furthermore, the alluvial sediments, which contain the artifacts, rest on a red paleosol which contains Archaic Period occupations at the Hominy Bend (34OS101) and the Hominy Bridge (34OS105) sites. As previously discussed, other Plains Woodland Period sites in the Verdigris River basin have been recorded resting on a red paleosol in association with burned sandstone concentrations (Keyser and Farley, 1979).

The Coldiron Site (34OS89)

The site is situated in a plowed field just north of the confluence of Wildhorse Creek with Hominy Creek (Figure 15). Hominy Creek forms the eastern boundary of the site while Wildhorse Creek flows along its western edge. The site is located on Hominy Creek's highest terrace (third) approximately 5 meters above the present stream channel. The terraces and remnants of the meandering Hominy Creek Channel define the migration of Wildhorse Creek's confluence with Hominy Creek (Figure 15). As Hominy Creek meandered, the mouth of Wildhorse Creek moved in concert; and the terraces were formed as a result. At the time of site occupation, Hominy Creek likely formed its southern boundary; and Hominy's confluence with Wildhorse Creek was further to the west. Since occupation, there has been a general southeastern movement of both water sources.

The site is confined along the upper terrace and is scattered a short distance into the field to the north. Surfacially, the Coldiron Site is characterized by considerable scatterings of burned sandstone intermixed with occasional pieces of chert. Investigation of the deep stream and exposure on the Wildhorse Creek side of the site revealed no cultural material in the deep homogeneous alluvial sediments. After an intensive surface reconnaissance, three 1 x .5 m test units were excavated in areas thought to have the greatest potential for the recovery of cultural materials.

Test unit 1 was placed on the eastern edge of the site in an area that appeared to be unplowed; it was also situated adjacent to a heavy scattering of burned sandstone. A 20cm level was excavated and screened through 6mm mesh screen. No artifacts were recovered with the only indication of culture debris being 9 pieces of burned sandstone. A further 10cm level was excavated with neither sandstone nor artifacts being found. The sediments were a homogeneous sandy-silt.

Test unit 2 was placed in the plowed field about midway across the peninsula. Four 10cm levels were dug and screened. The upper level contained numerous pieces of fired sandstone (smaller than fist-sized), 9 chert flakes, and 2 fragments of bifaces. The flakes are tertiary elements with 7 of them being nonheat-treated Keokuk, 1 piece of heat-treated

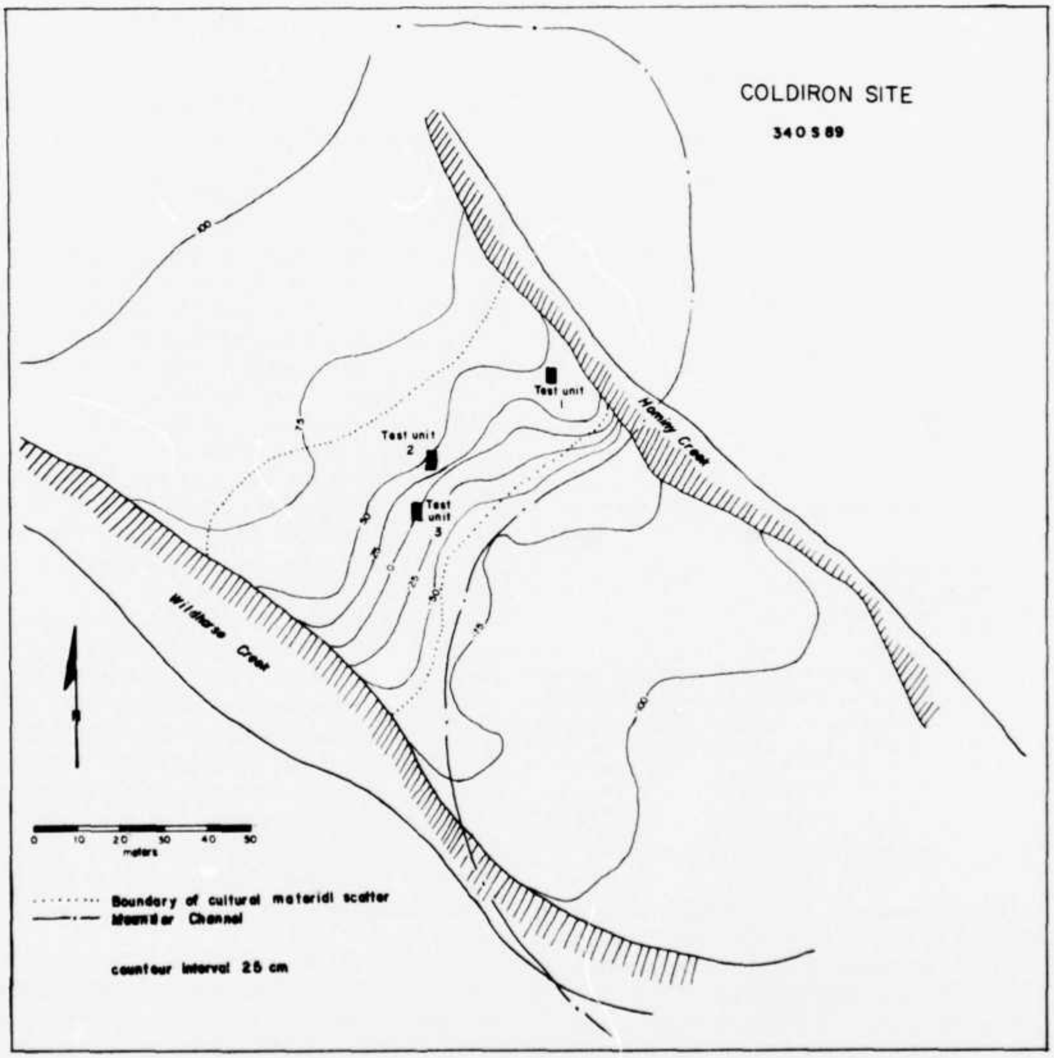


FIGURE 15: Site Map for the Coldiron Site (34OS89). Test pits are not to scale.

Florence, and 1 quartzite flake.

The amount of burned sandstone decreased dramatically in level 2 as did the artifacts. Only one Keokuk flake was collected. Level 3 contained no sandstone, and only two Keokuk flakes were recovered. Nothing was found in level 4. The 40cm of sediment were, again, a homogeneous sandy-silt.

Test unit 3 was placed approximately 15m to the west and slightly downslope from test unit 2. Three 10cm levels were excavated and screened. Level 1 as in test unit 2 contained numerous pieces of fired sandstone and 8 pieces of chert, all Keokuk. In the second level, flakes decreased to 3 (Keokuk) with burned sandstone almost non-existent. No chert or sandstone was found in level 3 of the excavation. The sediment again was the same homogeneous sandy-silt as was present in the other test units.

From the surface 8 chert pieces were recovered, mainly of the Keokuk variety. More importantly, though, was the recovery of a broken expanding stemmed dart point made of heat-treated Foraker chert. The point is typed as an Ensor.

In summation archaeological site 34OS89 has been heavily disturbed and scattered by repeated cultivation. The density of artifactual materials was low, and no faunal or organic remains were recovered. Based on a single dart point and geomorphological position, the site is tentatively assigned to the Woodland Period. No further work is recommended for the Coldiron site.

The Oxbow Site (34OS92)

This open site, just as The Coldiron Site (34OS89), was first reported in 1972 by G. Perino. The site is situated in a ploughed field around the sides of a Hominy Creek oxbow remnant which seasonally contains water (Figure 16). The site is 100 meters east of the present Hominy Creek stream channel. Both sites 34OS92 and 34OS89, 700m to the south, have similar elevations; and their geomorphological situations are results of the same meander sequence. The site is defined by burned sandstone and chert materials appear on the surface. One is north and slightly west of the oxbow at the base of a slope, and the other is centered on the higher knoll area directly adjacent to (south) the oxbow. Materials, if ever present, to the east have been totally scattered by ploughing.

On the basis of the surface scatters encountered on the day the site was tested, three 1 x 1 m units were excavated in the northwest scatter. All units were excavated in 10cm arbitrary levels and field screened through 6mm mesh screen.

The results of testing were disappointing. All of the test units were excavated to depths of 40cm with 110 non-tool elements and one biface fragment being the total recovered artifacts (Table 22). No bone or shell were encountered, and only a few flecks of charcoal were noted in the units. The sediments were the same homogeneous sand-silt alluvium as was encountered at Site 34OS89. Upon returning to the site for mapping purposes, the area of excavation was well as the rest of the field had been ploughed. An intensive surface reconnaissance at this time revealed the area to the south of the oxbow to be the more artifact-intense with the area around the test pits showing little surface material.

Recovered Artifacts

The surface collection of this knoll area contributed 78 additional non-tool elements and 16 tools to the total site artifact assemblage (Table 23). These recovered tools, fortunately, contain some diagnostic artifacts, in particular the projectile points. Four specimens classifiable as dart points were recovered with two being typeable. The typeable bifacial dart points are both assigned to the Gary type (Figure 17:c,d). The scraper group is represented by a complete elongate scraper with some bifacial retouch and a simple sidescraper on an elongated piece (Figure 17:b,e) one complete biface specimen was collected (Figure:f) as well as several other fragments. A single drill fragment which was missing both its base and most of its bit was recovered (Figure 17:a) as was a simple perforator on a secondary flake. Four retouched pieces including two with abrupt continuous obverse unilateral

TABLE 22

Grouped Excavated Materials from the Oxbow Site (34OS92).

Non-Tool Elements Element	N	%	Raw Material Varieties Type	%
Primary	0	0	Florence	25%
Secondary	1	.9	Keokuk	75%
Tertiary	107	97.3		
Bifacial Thinning	2	1.8		
	110			

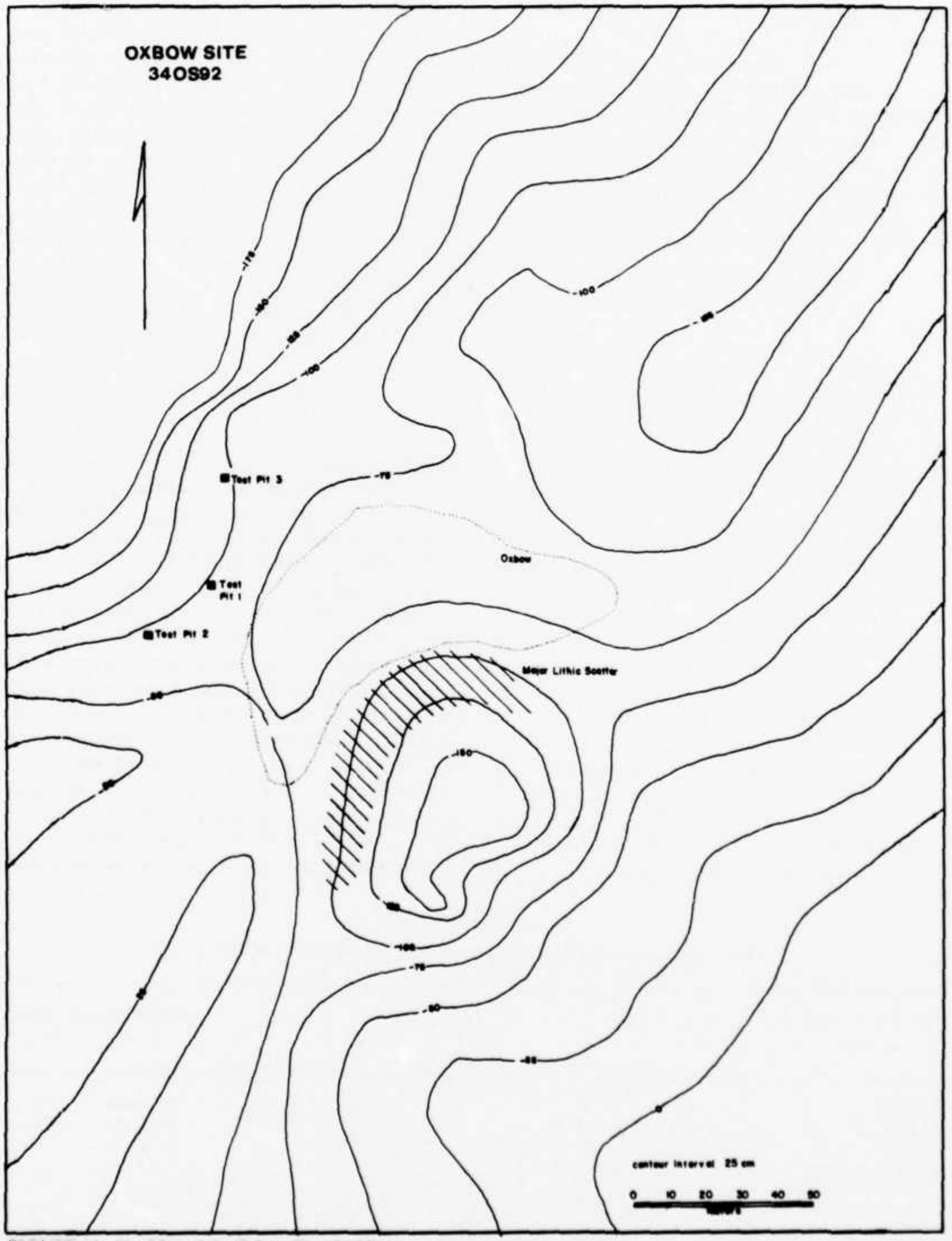


FIGURE 16: Site Map of the Oxbow Site (34OS92).

retouch and two with normal continuous obverse unilateral retouch round out the surface assemblage.

Summary and Conclusion

In conclusion the Oxbow site is similar to the Coldiron site to the south. However, the artifact densities are greater and its culture-historal position more firm. Based on the typed dart points and geomorphological situation, the Oxbow Site is assigned to the Woodland Period. The Oxbow "cake" represents a potential site for the recovery of a palynological column.

The Hominy Bridge Site (34OS105)

The site is situated at the base of a ridge-toe which extends onto the high terrace of Hominy Creek. The creek presently runs parallel to the western flank of the hill with only 40-50m of terrace separating the channel from the base of the ridge. *In situ* artifacts are limited to the slope of the ridge and do not appear within the terrace deposit. Although Highway 10 dissects the ridge-toe, the prehistoric occupation appears to have been restricted to the portion of the ridge south of the highway.

The site initially tested in 1974 (Gettys, Layhe and Bobalik, 1976), yielded artifacts attributable to the Archaic Period. In that only one other site in the study area has been recorded as being Archaic in

TABLE 23

Surface Collection Materials from the Oxbow Site (34OS92).

Tools Group	N	%	Raw Material Varieties Type	%
Scraper	2	12.50	Florence	17.6
Perforator	1	6.35	Keokuk	58.8
Drill	1	6.35	Neva	11.8
Retouched Piece	4	25.00	Other	11.8
Biface	3	18.75		
Dart Point	4	25.00	Heat Treated	35.3
Point/Biface	1	6.25		
Total	16	100.00		

Non-Tool Elements Element	N	%	Raw Material Varieties Type	%
Primary	3	3.88	Florence	14.3
Secondary	22	28.3	Foraker	2.6
Tertiary	44	56.4	Keokuk	58.8
Bifacial Thinning	7	8.9	Neva	15.6
Chunk	1	1.3		
Core	1	1.3		
Total	78	100.00	Heat Treated	45.5

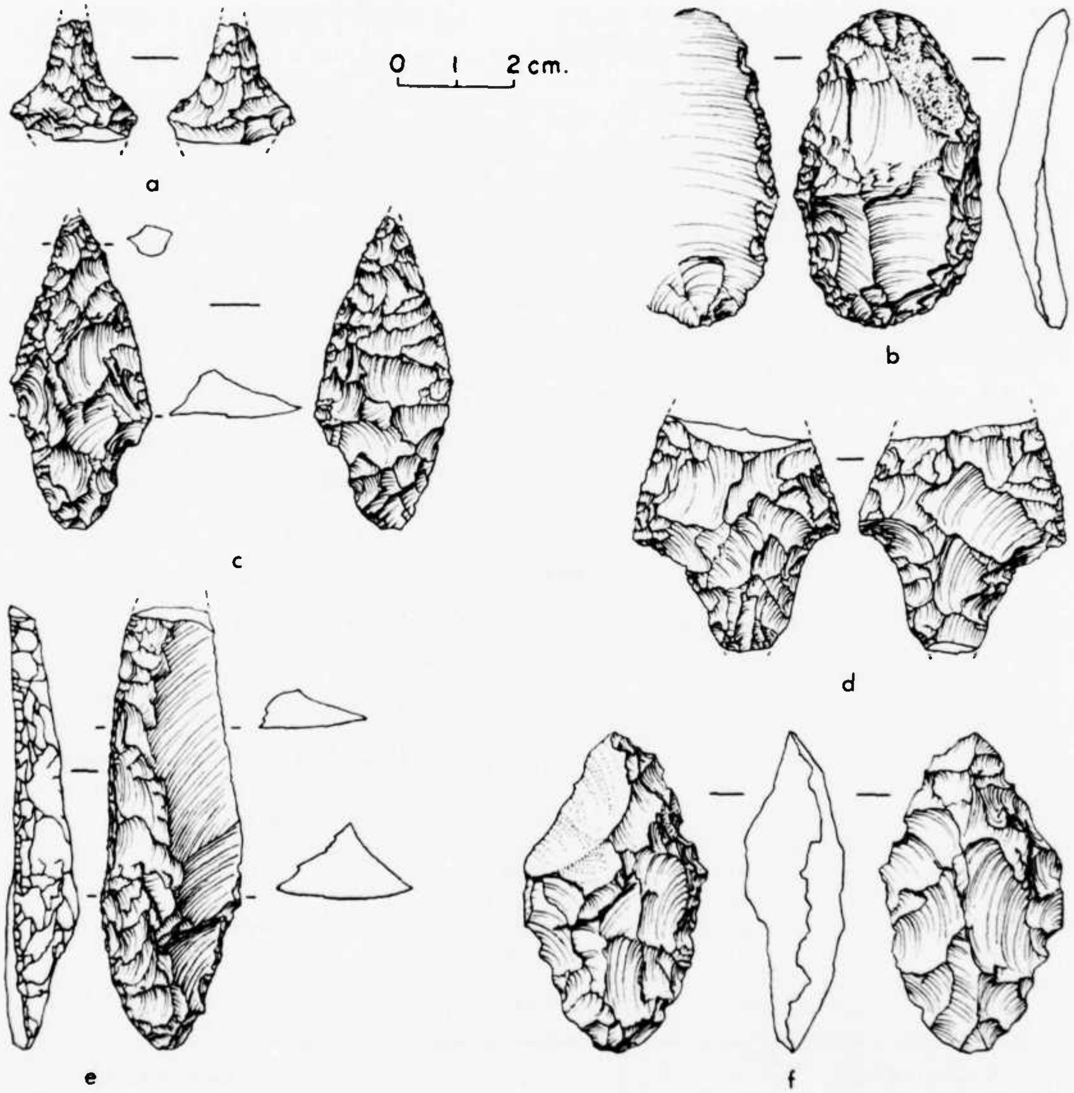


FIGURE 17: Selected Chipped Stone Tools from the Oxbow Site (34OS92). *a*-drill fragment, *b*-complete elongate scraper with some bifacial retouch, *c*, *d*-Gary points, *e*-simple sidescraper on an elongated piece, *f*-complete biface.

age, the establishment of the antiquity of the site and the correlation of the site's stratigraphy with that of the valley assumed considerable significance.

Description of the Excavation

A series of test pits were excavated across the site (Figure 18) during the Phase II investigation in an attempt to: (1) precisely determine the stratigraphic associations of the artifacts; (2) recover temporally sensitive artifacts which would assist in ascertaining the antiquity of the occupation; and (3) collect materials which could be radiometrically dated.

Stratigraphy

The excavation of the test pits revealed three distinct stratigraphic layers across the site (Figure 19, Table 24).

Layer A, the upper sediment unit, averages some 15cm in thickness. The sediment is a fine grained reddish brown silt with a small sand and clay fraction. It has a hard consistence when dry and a pH of 7.6. In the excavations near the crest of the ridge, units 5 and 8, layer A is blanketed by a recent deposit associated with road construction.

Layer B is a red silt with small amounts of sand and clay. The sediment has a very hard consistence when dry and a pH of 7.4. The layer B/C contact is graded. Layer C is a dark red silt-sized sediment with a small sand and clay fraction. The sediment has a very hard consistence when dry and a pH of 7.8. The thickness of the layer is considerably greater than the 25cm revealed in the test excavations. Both layers B and C appear to veneer the high ground and increase in depths and thicknesses toward the base of the hill.

All three layers appear to be included within the valley's red paleosol with layer A representing a recent soil forming episode upon the exhumed portions of the paleosol.

Recovered Artifacts

The artifacts recovered during the excavation were confined to chipped stone specimens. No organic evidence was retrieved.

Chipped Stone Tools

Only 9 tools were recorded from the excavation (Table 25) and they are treated as a single assemblage. The tools consisted of: a single end-scraper appearing on a thick secondary element; a retouched piece bearing alternate retouch on the obverse and inverse surface; two large fragments of broken bifaces; 2 dart point bases representing Gary and Ellis varieties; and 3 small bifacial fragments that represent either broken points or bifaces.

Non-Tool Elements

A total of 1,473 non-tool elements were recorded from the excavation (Table 26). Although the non-

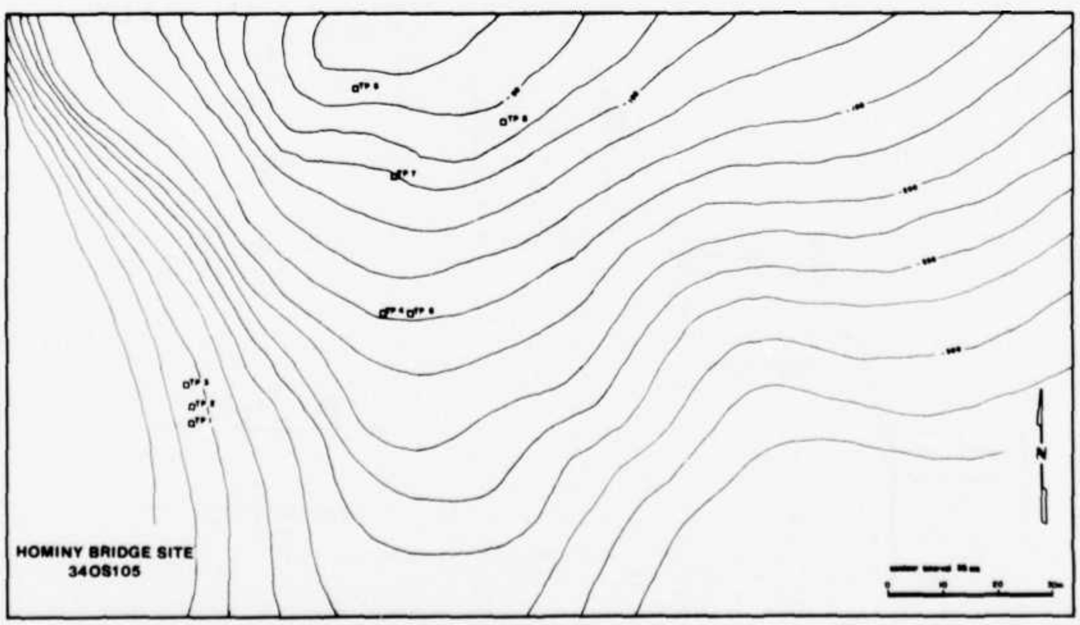


FIGURE 18: Site Map of the Hominy Bridge Site (34OS105).

tool element density varied considerably, particularly between layers B and C, the configurations of the assemblages in regard to non-tool elements were quite similar. Tertiary elements dominated the assemblages, followed by secondary, bifacial thinning, and primary elements. While the tertiary and bifacial thinning elements reflect the emphasis which was place upon the final stages of tool fabrication, the relatively high frequencies of primary elements and secondary elements denote that a considerable amount of initial processing occurred at the site. No cores, however, were recorded.

An examination of the dimensional distribution of non-tool elements defines a reduction sequence which is in concert with the stage reduction identified by qualitative attributes (Figure 20, Table 27).

Raw Material

Although five chert varieties were utilized for stone tools at the site, Florence and Keokuk cherts were predominantly employed (Table 28). Florence appears to have increased in usage through time, while Keokuk declined.

Cultural-Historic Affiliation

Although datable materials were not recovered from the excavation, the cultural-historical affiliation of the occupation of the site can be established through artifactual and geologic evidence.

During the initial investigation of the site, two Archaic point types (Darl and Wells varieties) were recorded (Gettys, Layhe, and Bobalik, 1976:71). The retrieval of additional Archaic point varieties (Gary and Ellis specimens) during the Phase II

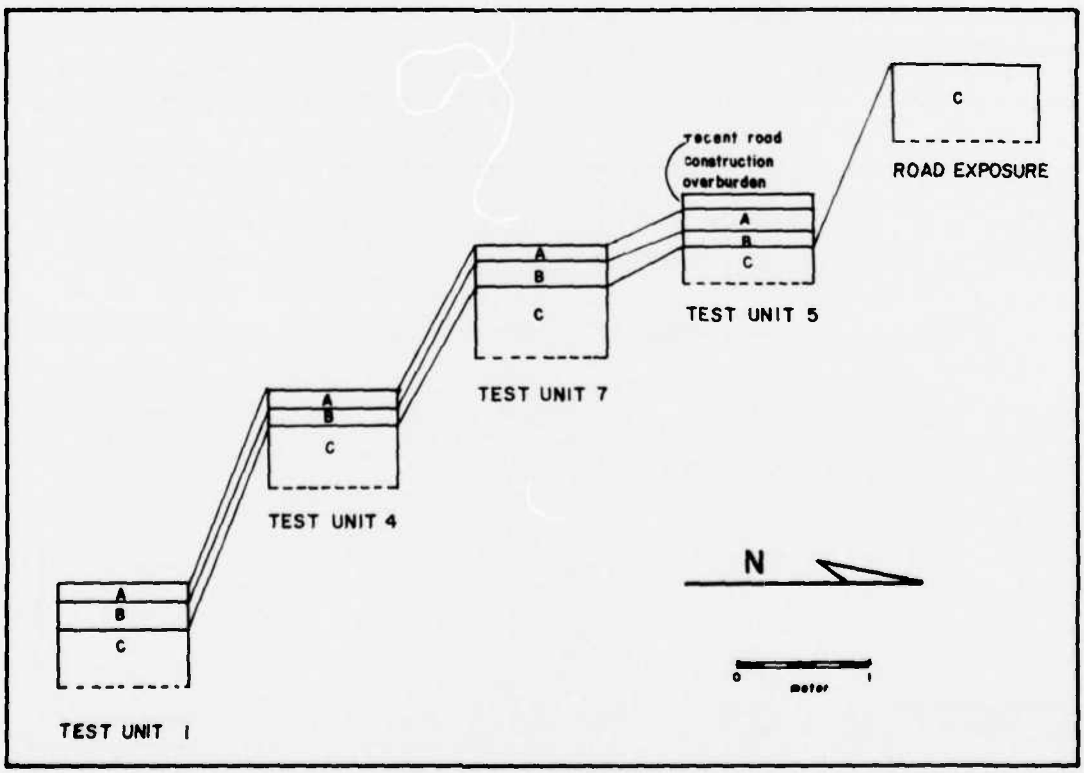


FIGURE 19: Schematic Stratigraphic Cross Section of the Hominy Bridge Site (34OS105).

investigation confirms an Archaic occupation of the site.

The stratigraphic position of the site within the valley's geologic history supports the chronologic placement of the occupation. The occupation rests within the red paleosol which underlies Woodland horizons at the Hominy Bend Site (34OS101) and the Williams Site (34OS160). The overlying Woodland age alluvium is in fact exposed on the western margin of the site where road construction activities have revealed a 3m section of the red paleosol and younger alluvium.

TABLE 24

Description of Sediments from the Hominy Bridge Site (34OS105).

Layer	Mean Thickness	Color	Texture, Dry Coherence	pH
A	15cm	Reddish brown 5YR 3/3	Silt, small fraction of sand and clay, hard	7.6
B	10-20cm	Red 2.5YR 4/6	Silt, small fraction of sand and clay, very hard	7.4
C	25cm+	Dark red 2.5YR 3/6	Silt, small fraction of sand and clay, very hard	7.8

TABLE 25

Tool Group Counts from Hominy Bridge Site (34OS105).

	Scraper	Denticulate	Notch	Burin	Perforator	Drill	Retouched Piece	Knife	Biface	Dart	Arrow	Point/ Biface	Multi-purpose/ Varia	Total
Test Pit 1 30-40cm	0	0	0	0	0	0	0	0	1	0	0	0	0	1
Test Pit 2 10-20cm	0	0	0	0	0	0	0	0	0	0	0	1	0	1
Test Pit 3														
10-20cm	0	0	0	0	0	0	1	0	0	0	0	0	0	1
20-30cm	0	0	0	0	0	0	0	0	0	2	0	0	0	2
Test Pit 4														
0-10cm	0	0	0	0	0	0	0	0	0	0	0	1	0	1
30-40cm	1	0	0	0	0	0	0	0	0	0	0	0	0	1
Test Pit 5 10-20cm	0	0	0	0	0	0	0	0	0	0	0	1	0	1
Test Pit 6 0-10cm	0	0	0	0	0	0	0	0	1	0	0	0	0	1
Total	1	0	0	0	0	0	1	0	2	2	0	3	0	9

TABLE 26

Non-tool Element Densities, Counts, and Frequencies from the Hominy Bridge Site (34OS105). Density is based on the number of elements/0.1 cu m of excavated fill.

Strata	Non-tool Density	Primary Element		Secondary Element		Tertiary Element		Bifacial Thinning Element		Chunk		Total
		N	%	N	%	N	%	N	%	N	%	N
A	37.3	7	1.3	49	8.8	491	87.6	13	2.3	–	–	560
B	42.7	15	2.1	60	08.5	613	87.0	16	2.3	1	0.1	705
C	12.6	12	5.8	23	11.1	169	81.2	4	1.9	–	–	208
Total		34		132		1,273		33		1		1,473

Sites 34OS84, 34OS93, and 34OS110

As a result of the destruction, misidentification, and an absence of cultural materials four sites failed to provide meaningful archaeological information.

Site 34OS84, as identified by legal description (Rohrbaugh and Wyckoff, 1969; Gettys, Layhe, and Bobalik, 1976), was examined through shovel test-testing over a wide area and failed to yield artifacts Although artifacts were reported as coming from Site 34OS84 during the testing of the site (Perino, 1972), there is reason to believe that the testing was actually conducted on the nearby Williams Site (34OS160) (Gettys, Layhe, and Bobalik, 1976:32). In summary, Site 34OS84 has failed to furnish any archaeological evidence either from the surface or subsurface and therefore is not recommended for additional investigation.

Site 34OS90, a rockshelter originally named Turkey Creek Shelter Number 1 (Rohrbaugh and Wyckoff, 1969:15), was tested to a depth of 40cm with two contiguous 1 x 1 square meter pits. The excavation was terminated on a large sandstone block. In that no cultural material was recovered from the excavation, additional work is not recommended at the site.

Site 34OS93, an open site situated between an oxbow and the channel of Hominy Creek (Rohrbaugh and Wyekhoff, 1969:16), was entirely removed by the construction of the bridge for the new highway routing.

Site 34OS110, an open site exposed by a road cut, was apparently destroyed in widening the road. Although the initial legal and descriptive location of the site (Perino, 1972:15) did not agree, the descriptive location was apparently accurate (Gettys, Layhe, and Bobalik, 1976:112). Examination of the site and shovel testing failed to identify any artifactual material; therefore, no additional work is recommended at the site.

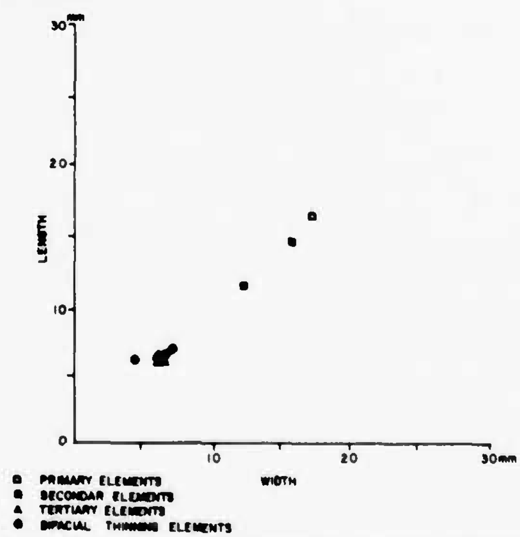


FIGURE 20: Dimensional scattergram comparing unbroken non-tool elements and tools from the Hominy Bridge Site (34OS105). Data points represent mean dimensions by strata for the various artifact classes.

TABLE 27

Dimensional Data on Unbroken Tools and Non-tool Elements from the Hominy Bridge Site (34OS105).

	N	Length/mm $\overline{X}$	Length/mm S.D.	Width/mm $\overline{X}$	Width/mm S.D.	Thickness/mm $\overline{X}$	Thickness/mm S.D.
Strata A							
Primary	1	17.0	0.0	20.0	0.0	3.7	0.0
Secondary	26	14.8	6.0	15.5	6.0	3.3	1.8
Tertiary	71	6.4	3.3	6.0	3.9	0.9	0.7
Bifacial thinning	10	6.5	2.8	6.5	2.1	1.0	0.2
Strata B							
Primary	8	16.6	6.3	17.0	4.8	3.9	1.8
Secondary	14	11.4	6.1	12.0	5.1	2.4	1.3
Tertiary	90	6.1	3.0	5.9	3.0	0.9	0.6
Bifacial thinning	15	6.7	3.1	7.1	3.4	1.1	0.8
Strata C							
Tools	1	46.0	0.0	36.0	0.0	16.3	0.0
Primary	1	23.0	0.0	41.0	0.0	12.0	0.0
Tertiary	30	6.1	3.3	6.1	3.3	0.9	0.5
Bifacial thinning	3	6.0	1.0	4.3	1.5	0.9	0.2

TABLE 28

Raw Material Varieties from the Hominy Bridge Site (34OS105).

	N	Florence %	Foraker %	Keokuk %	Tahlequah %	Neva %	Other %	Heat-treated %
Strata A								
Tools	3	33.3	–	66.6	–	–	–	33.3
Non-tools	560	22.7	2.3	70.9	0.7	0.2	3.2	51.1
Strata B								
Tools	5	20.0	–	80.0	–	–	–	60.0
Non-tools	705	31.5	0.4	66.4	1.1	0.4	0.1	67.0
Strata C								
Tools	1	–	–	100.0	–	–	–	100.0
Non-tools	208	36.5	3.8	57.7	–	1.0	1.0	59.6

PALEOENVIRONMENTAL SYNTHESIS OF HOMINY CREEK VALLEY:

POLLEN AND LAND SNAIL EVIDENCE

Stephen A. Hall North Texas State

Pollen Analysis

In the report on the first season's work in Hominy Creek Valley, two pollen diagrams were presented and discussed, Big Hawk Shelter and adjacent Cut Finger Cave (Hall, 1977a). The pollen record from Big Hawk is the longest in the region, dating from about A.D. 300 to 1500 (since the 1977 report, a radiocarbon date of 420 ± 70 B.P., SMU-522, was obtained from the 10 to 20cm level; (Henry, 1978b).

Big Hawk Shelter

The pollen diagram from Big Hawk Shelter shows that the vegetation has been an oak and oak-hickory forest throughout the past 1,600 years (the last 400 years are not represented in the record). The main feature of the pollen succession that suggests the existence of past vegetation and environmental conditions that differ from those of today is the comparatively high abundance of hickory (Carya) in the lower portion of the diagram. Hickory frequencies rise from 2 percent at 98 to 100cm to a peak of 12 percent at 74 to 77cm depth from which it steadily decreases to 3 percent at 1 to 3cm depth. Modern surface pollen assemblages from the vicinity of Big Hawk Shelter contain 0 to 0.8 percent hickory in the Hominy Creek floodplain, 1.6 percent in the wooded slope above the floodplain near the rockshelter, and 0.8 to 4.8 percent in the upland oak forest above the shelter (Hall, unpublished data). Although the several species of hickory in eastern Oklahoma today include both upland and floodplain forms, the surface pollen data suggest that hickory is more important in uplands; the same is assumed for the past, and the higher abundance of hickory in the Big Hawk pollen record is thus considered to represent upland species. The increased hickory frequencies between 32 and 90 cm depth are interpreted as a period of greater hickory tree abundance in the upland oak forest which in turn is interpreted as related to greater moisture availability. The entire zone of abundant hickory dates from A.D. 400 to 1050, and the peak of hickory abundance dates about A.D. 600. The increase in hickory from A.D. 400 to 600 is interpreted as indicating a climatic shift to slightly increased precipitation. The decreased hickory beginning A.D. 600 probably means the wet period ended. Whether the climate shifted suddenly back to drier conditions and the hickory component of the forest required 450 years to die back and be replaced by oak, or whether the shift to drier climate conditions occurred slowly over the 450 year period from A.D. 600 to 1050 cannot at present be determined by pollen analysis. This question is addressed further in the discussion and synthesis section.

Cut Finger Cave

The sedimentary record from Cut Finger Cave is much more brief than that from Big Hawk. The lower part of the sequence is dated A.D. 1050 and a middle horizon is dated A.D. 1200; the upper portion probably extends to A.D. 1400 or 1500.

The Cut Finger Cave pollen succession overlaps in time the upper half of the Big Hawk pollen sequence. However, the two have little in common. The Cut Finger diagram shows oak to be only about 10 percent throughout the sequence, while grass (Gramineae), *Ambrosia*-type, and *Chenopodium*-type together comprise about 40 percent of the pollen assemblages. The Big Hawk record for the same period shows the opposite: high oak and low grasses and weedy plants. Another incongruous fact is the high modern oak pollen frequency, about 50 percent, obtained from the interior of the cave compared to the low prehistoric oak frequencies. The low pollen frequencies of oak cannot at present be explained.

Cedar Creek Shelter

A series of 11 pollen samples were collected in 1977 from a 60cm deep excavation wall of Cedar Creek Shelter. The samples were processed by Dr. Vaughn M. Bryant's Palynology Laboratory at Texas A & M University using a laboratory schedule similar to the one the writer applied to Big Hawk Shelter and Cut Finger Cave sediments. Two Lycopodium spore tablets, each tablet containing 12,500 ± 500 spores, were introduced to each weighed sample at the onset of laboratory processing.

All of the samples from Cedar Creek Shelter contain fossil pollen. However, only the two uppermost samples from the 0 to 6cm interval contain over 1,000 pollen grains per gram (Figure 21). Below 6cm pollen concentration drops rapidly and in the bottom sample is calculated at only 33 grains per gram. In comparison with Big Hawk Shelter, Cedar Creek Shelter has much lower pollen concentration and a greater abundance of indeterminable pollen grains. Regardless, the high frequencies of hickory especially in the 19 to 24cm spectrum, where the pollen sum is 108 and concentration is 240 grains per gram, probably reflect a generally greater abundance of hickory in the past forest vegetation than today. This corresponds with the Big Hawk pollen succession. However, the lower pollen samples are useless for interpretation owing to the low pollen counts. Additional grains from these lower samples could have been counted at great expenditure of time and effort, but the resulting pollen frequencies would probably have little usefulness owing to the likely high abundance of indeterminable grains and the likelihood that the pollen counts from the poorly preserved material would be biased. Overall, the Cedar Creek Shelter pollen diagram is not very helpful as a guide to past vegetation or paleoenvironmental trends.

Snail Analysis

Land snails, and a few aquatic snails, have been reported from three sites along Hominy Creek: Big Hawk Shelter (Hall, 1977a; Henry, 1978a) and Copperhead Cave and Cedar Creek Shelter (Hall, 1973). The species recovered from these sites are the same, both throughout the cave and rockshelter deposits and from site to site. The faunas are dominated by two species, *Anguispira alternata* and *Helicodiscus parallelus*. Although the species found in each site occur throughout the excavated deposits, one consistent change in land snail community is documented. Relative frequencies of the large shelled *A. alternata* are high in the lower part of the rockshelter deposits, then decline toward the top. The greater abundance of *A. alternata* is interpreted as indicating the presence of a large number of moist wooded habitats which in turn indicates slightly greater precipitation than occurring today. Beginning about A.D. 400 to 900, a more precise date is not yet determined, the decreased abundance of *A. alternata* suggests that the moist habitats diminished, indicating a shift towards drier conditions. The drying trend probably continues to today, although it is not known for certain because the rockshelter record ends about A.D. 1500.

Big Hawk Shelter

The earlier report on snails from Big Hawk Shelter presents the analysis of 1459 shells from the 1976 season of excavations (Hall, 1977a). During the 1977 season, excavations were extended over a greater area and 20cm (2 levels) deeper, resulting in the recovery of an additional 12,841 shells (Table 29). The new material shows the same trend in *Anguispira alternata* abundance that emerged from

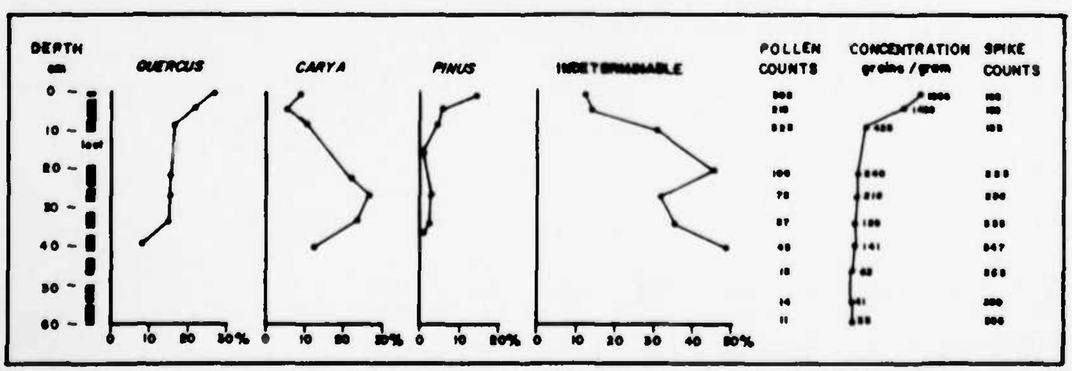


FIGURE 21: Selected pollen profiles from Cedar Creek Shelter (34OS98). The 12-16cm pollen sample was lost.

TABLE 29

Counts and Frequencies of Land Snails by Level from Big Hawk Shelter (34OS114), 1977 Excavations.

	Depth/ cm 0-10		10-20		20-30		30-40		40-50		50-60		60-70		70-80		80-90		90-100		100-110		110-120		120-130	
			N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%	N	%
Anguispira alternata	47	5.2	40	15.4	62	16.4	124	18.6	266	18.2	473	20.7	513	22.5	578	30.1	253	35.1	245	27.6	197	20.9	19	22.1	7	15.2
Helicodiscus parallelus	351	38.5	107	41.3	135	35.6	317	47.7	679	46.8	965	42.3	967	42.4	736	38.3	236	32.7	324	36.4	475	50.4	34	39.5	26	51.0
Polygra d. dorfeuilliana	70	7.7	26	10.0	50	13.2	59	8.9	42	2.9	122	5.3	150	6.6	153	8.0	76	10.4	62	7.0	51	5.4	11	12.8	4	8.7
Triodopsis cragini	3	0.3	1	0.4	1	0.3	–	–	3	0.2	5	0.2	1	<0.1	1	0.1	–	–	–	–	–	–	–	–	–	–
Zonitoides arboreus	45	4.9	26	10.0	23	6.1	38	5.7	58	4.0	108	4.7	127	5.6	84	4.4	33	4.6	49	5.5	27	2.9	3	3.5	4	8.7
Mesovitrea indentata	155	17.0	16	6.2	14	3.7	31	4.7	50	3.4	71	3.1	102	4.5	61	3.2	19	2.6	34	3.8	29	3.1	8	14.9	1	2.2
Hawaiia minuscula	–	–	5	1.9	8	2.1	20	3.0	68	4.7	117	5.1	76	3.3	42	2.2	10	1.4	28	3.1	24	2.5	2	2.3	1	2.2
Strobilops labyrinthica	179	19.6	20	7.7	66	17.4	55	8.3	221	15.2	326	14.3	265	11.6	183	9.5	59	8.2	90	10.1	102	10.8	6	7.0	1	2.2
Gastrocopta armifera	3	0.3	1	0.4	5	1.3	12	1.8	21	1.4	39	1.7	53	2.3	51	2.7	21	2.9	26	2.9	13	1.4	1	1.2	–	–
Gastrocopta contracta	21	2.3	7	2.7	12	3.2	6	0.9	34	2.3	42	1.8	23	1.0	20	1.0	4	6	12	1.3	15	1.6	1	1.2	1	2.2
Gastrocopta corticaria	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	0.1	–	–	–	–	–	–	–	–	–	–
Mesodon t. thyroides	–	–	–	–	–	–	–	–	–	–	3	0.1	1	<0.1	2	0.1	–	–	1	0.1	1	0.1	–	–	–	–
Vallonia parvula	–	–	–	–	–	–	–	–	1	0.1	4	0.2	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Stenotrema leai aliciae	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	0.1	–	–	1	0.1	–	–	–	–	–	–
Euconulus Sp	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	0.1	–	–	–	–	–	–
Succinea Sp	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	1	0.1	–	–	–	–	–	–
Polygra-Triodipsis (Broken)	37	4.1	9	6.2	3	0.8	3	0.5	6	0.4	4	0.2	2	0.1	–	–	–	–	–	–	–	–	–	–	–	–
broken-undeterminable	1	1.0	1	0.4	–	–	–	–	–	–	–	–	2	0.1	6	0.3	8	1.1	14	1.6	8	0.8	1	1.2	1	2.2
Amnicola integra	–	–	–	–	–	–	–	–	2	0.1	1	<0.1	1	<0.1	2	0.1	2	0.3	1	0.1	–	–	–	–	–	–
Physa anatina	–	–	–	–	–	–	–	–	–	–	1	<0.1	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Helisoma anceps	–	–	–	–	–	–	–	–	1	0.1	1	<0.1	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Total Shells	912		259		379		665		1,452		2,282		2,283		1,921		721		889		942		86		46	
Shells/ 0.1cu m	192		94		126		166		363		326		247		233		107		178		209		86		46	

analysis of the 1976 shells (Figure 22). However, there are some differences and aspects of the larger shell collection that add new information on the land snail succession.

A comparison of the relative frequency of two species, *Anguispira alternata* and *Helicodiscus parallelus*, from the 1976 and 1977 shell data shows clearly that the large shelled form *A. alternata* is only one-half as abundant in the 1977 collection as it is in the 1976 material. The much smaller form *H. parallelus* shows the opposite relation: *H. parallelus* shells in the 1977 collection are twice as abundant as those recovered in 1976. The large shelled species *Polygyra dorfeuilliana dorfeuilliana* also exhibits a consistent difference in abundance with 1970 frequencies, about twice that of 1977 frequencies. The explanation for these differences in abundance is probably due to the extreme size differences of the species and the unequal skill of the laboratory assistants in picking the numerous small shells of *H. parallelus*. During laboratory processing of the 1976 material, the assistants probably missed picking out many of the small *H. parallelus* shells resulting in greater relative frequencies of the larger, more obvious shells of *A. alternata* and *P. d. dorfeuilliana*. During the 1977 season, more careful picking resulted in more shells of *H. parallelus*, thus higher relative frequencies of *H. parallelus* and lower frequencies of *A. alternata* and *P. d. dorfeuilliana* compared to the previous year's work. Noteworthy is the fact that, given the comparatively small sample size of shells from 1976 season's excavations and the likelihood of less careful picking of that material, the decreasing abundance of *A. alternata* is shown clearly in both 1976 and 1977 records. These results give more confidence to the paleoenvironmental interpretations from the Copperhead Cave and Cedar Creek Shelter land snail successions even though they are based on small numbers of shells.

The large number of shells recovered during the 1977 season produces much smoother species profiles without gaps than yielded by the small 1976 collection. The species *Gastrocopta armifera*, *G. contracta*, *Strobilops labyrinthica*, *Zonitoides arboreus*, and *Hawaiia minuscula* all show discontinuous profiles in the diagram of the 1976 data; the more complete 1977 diagram shows continuous profiles for all give species. The relative frequencies are also not as irregular from level to level in the 1977 diagram. The larger sample size has resulted in an increase in number of land snail species in the Big Hawk Shelter deposits from 12 to 16. The species new to the fauna are *Gastrocopta corticaria*, *Mesodon t. thyroides*, *Stenotrema leai aliciae*, *Euconulus* sp., and *Vallonia parvula*. One species, *Punctum minutissimum*, was not identified from the 1977 shell material. An additional aquatic snail, *Amnicola integra*, was also added to the fauna, but the pill clam, *Sphaerium*, was not seen, although it was recovered from one level the previous season. The additional shell material has resulted in the

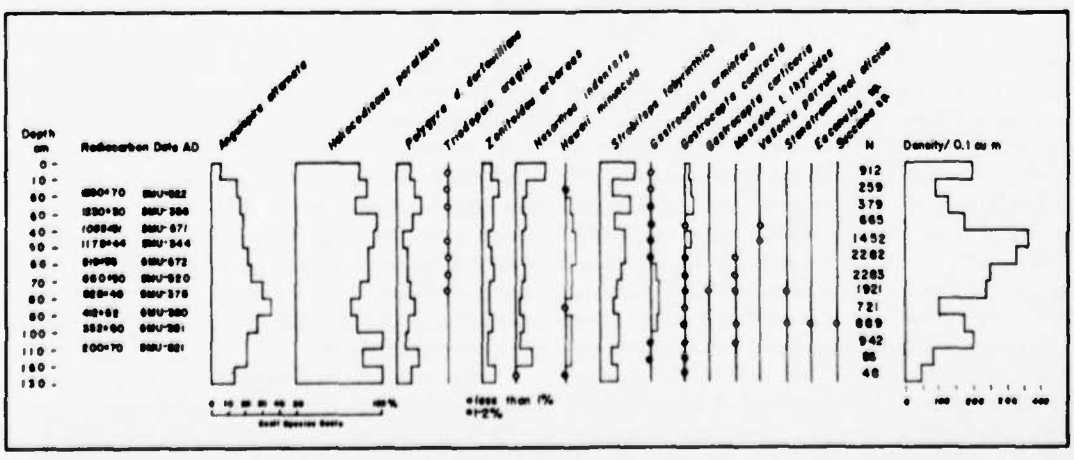


FIGURE 22: Land snail diagram, Big Hawk Shelter (34OS114), 1977 excavations; snail diagram from data in Table 29; diagram snail diagram and date from 1976 excavations in Hall, 1977a.

extension of the basal range of *Triodopsis cragini* from the 40 to 50 cm level to the 70 to 80 cm level. Both seasons' excavations failed to produce an identifiable shell of *T. cragini* from the 30 to 40 cm level.

Stenotrema leai aliciae is recorded from two lower levels at Big Hawk, and from three upper levels at Cedat Creek Shelter (Hall, 1978). The northern form *S. l. leai*, generally restricted to Pleistocene sediments in the Southern Plains, is reported from Copperhead Cave (Hall, 1978), and from Sunny Shelter on Birch Creek (Hall, 1977c). The *Stenotrema* shells, there are not many from these four sites, were assembled and studied collectively. Most of the shells have a partially open umbilicus such as the individuals illustrated by Chetum and Fullington (1971, pl. VIII, Fig. 3). However, the same shells are larger than the typical *S. l. leai* and have a comparatively long parietal tooth. The *Stenotrema* shells, including the ones I reported before as *S. l. leai*, are now referred to *S. l. aliciae*.

Shell Concentration

The Big Hawk Shelter snail diagram shows in the right panel the number of shells recovered per 0.1 cubic meter of sediment excavated (Figure 22). These values of shell concentration are averages for each 10cm level removed and screened during the 1977 excavations. Data presented and discussed later show that shell concentrations (number of individual shells per volume of sediment) from one level vary from one portion of the site to another, as well as from one level to another.

Shell concentrations at a site of deposition are determined by two factors: rate of shell influx and rate of mineral sediment influx. Shell material entering a site can originate by (a) the washing in of dead and live shells, (b) live snails being attracted to the site for some reason, or (c) dead or live shells being brought to the site by animals or prehistoric man. At Big Hawk Shelter, sediment influx is due to either colluvial or eolian processes, or both. The shelter is too far above Hominy Creek to have been reached by flood waters, thus is devoid of alluvial sediments. The five variables of shell and sediment influx may together result in a complicated pattern of shell concentration throughout the deposit at a single rockshelter. (The above variables do not take into account the skills and carefulness of the digger, screener, and picker; shell recovery success can be tested by introducing a known number of extra-local shells, both small and large fragile into occasional loads of matrix that are to be screened and picked for snail analysis). A series of ten radiocarbon dates from Big Hawk shows that sedimentation rates at the rockshelter have been reasonably constant from about A.D. 200 to A.D. 1500 (Henry, 1978b, p. 25–28). Thus, with the rate of deposition more or less constant, sediment influx at Big Hawk can be set aside as a factor affecting shell concentration, leaving the three shell influx variables as agents of shell abundance.

Except for a few aquatic snails that were probably brought to the shelter attached to aquatic plants or clam shells (Metcalf, 1977), it is unlikely that any of the land snails were harvested for food. Most of the snail fauna is represented by small species, there is no ethnographic information mentioning that land snails were a part of Southern Plains diet, and only an occasional shell, less than one percent, shows the typical gray color of heating or burning; the abundant charcoal in the rockshelter deposit is evidence of many prehistoric campfires that would have scorched any shell material present in the soil around the hearth. The origin of the land snail fauna at Big Hawk is either by shells washing into the shelter by slope wash or by snails entering the shelter, attracted by the trash and debris left behind by the prehistoric occupants. The geologic investigations necessary to determine whether mineral sediments at Big Hawk Shelter accumulated by wind or sheet erosion or a combination of the two have not been made. However, stratigraphic layers of the rockshelter occur as moderately horizontal zones of uniform thickness, even around large blocks of fallen rock, suggesting that the sediment probably includes at least a large eolian component. If most of the sediment had originated from sheet erosion of adjacent slopes, the stratigraphic layers would probably be wedge-shaped; however, they are not. If the shelter sediments accumulated largely by eolian activity, then the snail shells were not washed in, rather must have been attracted to the shelter by the debris from prehistoric occupation.

A plot of recovered shells by quarter-meter squares within 10cm levels shows a concentration of shells in the southwest corner of the rockshelter, especially grid square F5 and adjacent F6, G5, and G6 (Figure 23). Shells are also concentrated vertically in the shelter in a zone between 40 and 80cm

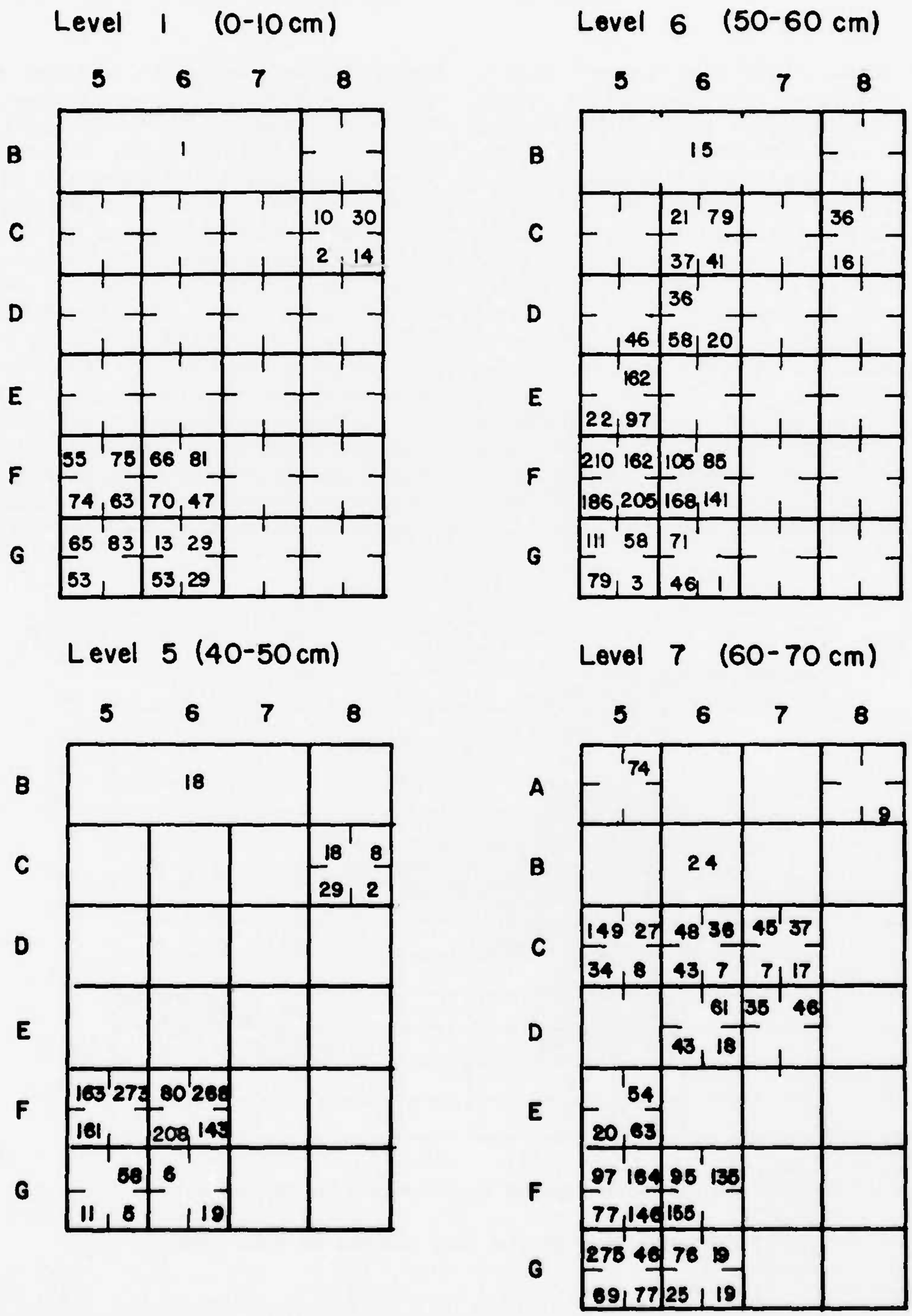


FIGURE 23: Horizontal snail shell distribution, one-quarter meter squares, Big Hawk Shelter (34OS114), 1977 excavations; each number is shells recovered per 0.0125 cu m of excavated sediment; shell data absent from blank squares; shells of 1976 excavations from grid squares B5, B6, B7.

depth (Figures 22 and 24). Grid squares from the back of the rockshelter produced the smallest amounts of shell material. Grid squares B5, B6, and B7 were excavated in 1976 to a depth of 110cm. None of the 10cm levels from the above three grid squares yielded over 100 shells per 0.1 cubic meter; shell concentration ranged from 1 to 94, and the average for all levels is 44 shells per 0.1 cubic meter. In contrast, the shell material recovered in 1977 from excavations extended to the front of the rockshelter ranges from 51 to 363 shells per 0.1 cubic meter and averages for all levels 183 shells per 0.1 cubic meter.

If land snails were attracted to rockshelter litter in the past, there should be a correspondence of shell concentration with some aspect of prehistoric occupation. The most likely component of prehistoric debris that would attract snails is bone litter. Shell concentration and bone concentration (from Butler, 1978, Table 32) from the same 10cm levels and grid squares were plotted (Figure 25). The resulting graph shows a broad scatter of points that only in general suggests that where bones are abundant, so are snail shells. When average shell and average non-tool concentrations from each level (from Henry, 1978b, Table 18) are compared, there is a general trend showing that shell and non-tool concentration vary together; high shell and high non-tool abundances occur together (Figure 26). Here then is a general relationship between shell and cultural data: shells are concentrated where bone and chipping debris are abundant. This probably means that land snails are attracted to the cultural debris and will be found concentrated in midden areas of a prehistoric

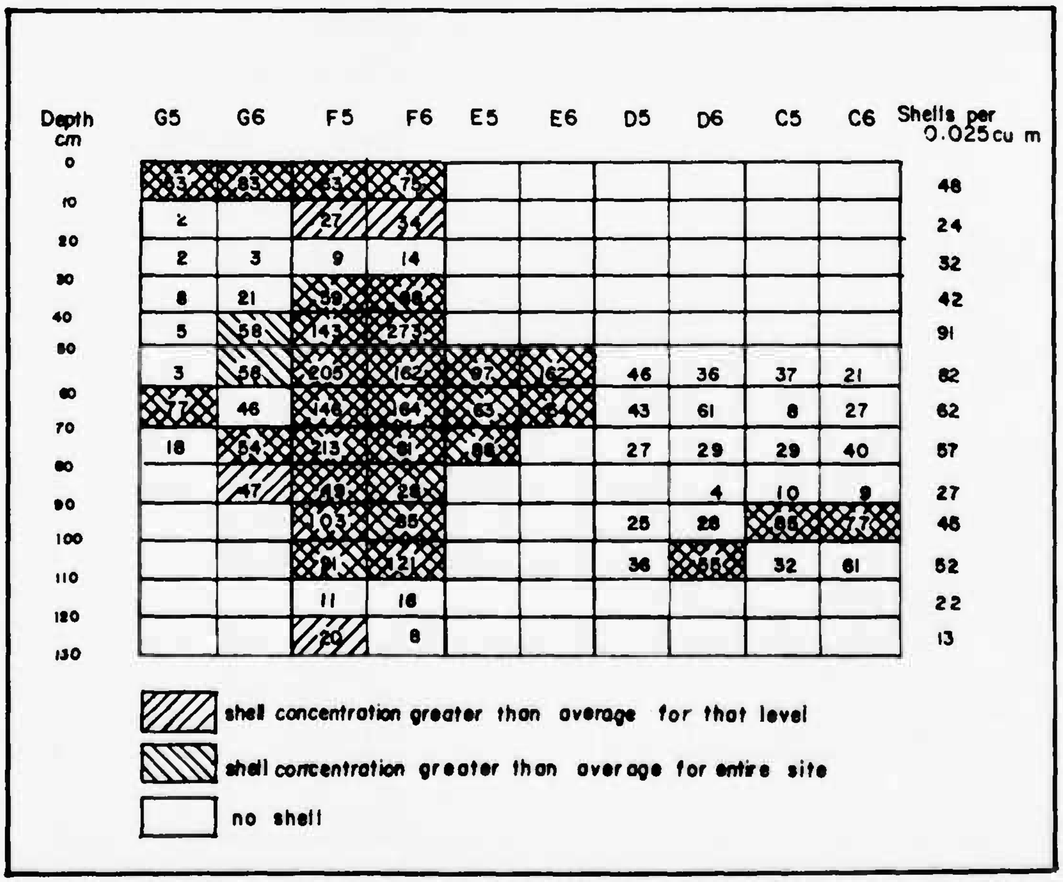


FIGURE 24: Vertical snail shell distribution, one-quarter meter squares, Big Hawk Shelter (34OS114), 1977 excavations; average shell concentration for each level is shown at the right.

occupation. (Another explanation of the shell-non-tool relationship could involve small changes in rates of sedimentatin that are not detected by radiocarbon dating: the overall problem of cultural and paleontologic material's abundance in relation to depositional rate can be investigated much further).

Paleoecology

The first report on the Big Hawk Shelter snail fauna pointed out the similarity of the snail abundances from one level to another and concluded that, based on snails, past environmental conditions along Hominy Creek were similar to that of today (Hall, 1977a). It was not until further molluscan work at Sunny Shelter, Copperhead Cave, and Cedar Creek Shelter showed similar faunal changes did the writer reevaluate the record from Big Hawk. Also, the additional shells recovered during the 1977 excavations at Big Hawk Shelter produce much clearer trends, although the same trends for each species, than shown by the earlier diagram.

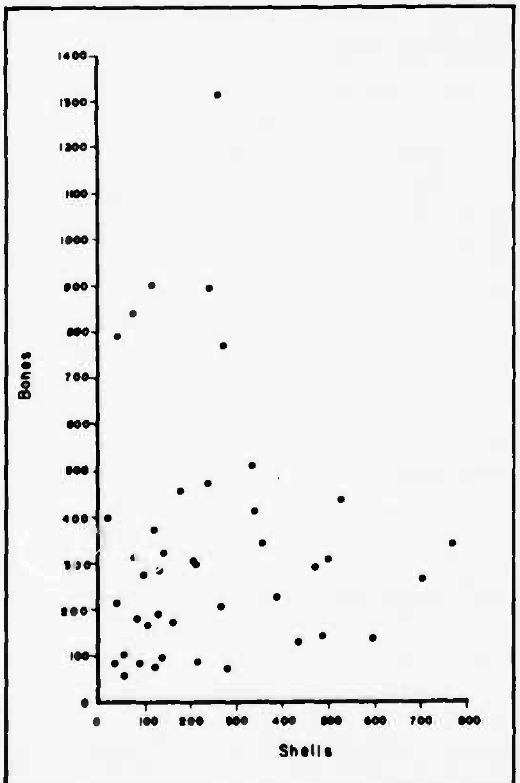


FIGURE 25: Numbers of shells and bones recovered from same 0.1 cu m grid square and level, Big Hawk Shelter (34OS114), 1977 excavations; bones include gar scales.

The Big Hawk Shelter snail diagram shows one major trend: *Anguispira alternata* increases in frequency from about 15 percent at the base of the excavation to 35 percent at the 80 to 90cm level from which it constantly declines to 5 percent at the top of the rockshelter deposit (Figure 22). The other principal species in the fauna, *Heliodiscus parallelus,* does not change in abundance, although at Cedar Creek shelter it declines in frequency in conjunction with decreasing *A. alternata,* and it declines markedly at Sunny Shelter on Birch Creek (Hall 1977c).

The ecology of *Anguispira alternata* is not known for northern Oklahoma, although the species is recorded from Osage and adjacent counties. The most thorough study of Southern Plains snail habitats and associations that pertain to Hominy Creek investigations was made by A. L. Metcalf in nearby Cowley County, Kansas (Metcalf, 1962). The results from that study are incorporated in the following discussions of the Big Hawk snail fauna.

Metcalf recognized five basic habitats in Cowley County which apply to Hominy Creek: (1) moist wooded floodplains, (2) dry wooded hillslopes, (3) dry oak uplands, (4) moist prairies with hillside seeps, and (5) dry prairies with rocky hillsides. The sixteen species of land snails recovered from Big Hawk Shelter are shown in Table 30 with their habitat preferences. (Metcalf did not find any snails in the Cowley County blackjack oak uplands, so that habitat category is excluded from the table). The habitat preferences of the Big Hawk Shelter assemblage are clearly in the direction of moist wooded environments. Seven species are found today exclusively in this type of habitat. Two species prefer dry wooded hillsides above the more moist floodplains. The remainder of the species are found in a wider range of habitats from moist wooded floodplains to moist prairies, and three species to dry prairie sites. Accordingly, the Big Hawk snails are grouped into 4 habitat associations: (a) moist wooded floodplains, (b) dry wooded hillsides, (c) moist wooded floodplains and moist prairies, and (d) moist wooded floodplains, moist prairies, and dry prairies. None of the snails from Big Hawk occur exclusively in either moist or dry prairie habitats. All are found in moist wooded floodplains except *Polygyra d. dorfeuilliana* and *Triodopsis cragini* which prefer drier wood hillslopes. The relative frequencies of all snails in each of the four habitat associations are plotted by level in Figure 27. The resulting profiles show that moist woods snails increase, then decrease in abundance, following closely the trend of *A. alternata*, and the dry wood snails decrease slightly then increase beginning the 30 to 40cm level. The moist woods-moist prairie snails mirror the moist woods trend, probably in part due to the fact that these two categories together account for 80 to 90 percent of the fauna and a decrease in one will result in an increase in the other. The fourth habitat association that includes the three species that occupy both dry and moist places shows no major change in frequency throughout the rockshelter deposit. A final profile resulting from the addition of moist woods (A) and moist woods-moist prairies (C) shows fairly constant then decreasing frequencies beginning with the 30 to 40cm level. This A + C profile mirrors somewhat the dry woods (B) category.

Overall, the Big Hawk shelter snail succession shows that moist habitat snails were more abundant in the lower portions of the rockshelter deposit than in the upper part. The high frequencies of *Anguispira alternata* that peak at the 80 to 90cm level (dated A.D. 400 to 500) are interpreted as reflecting a much greater abundance of moist habitat availability than earlier and later in time. The steadily decreasing frequencies of *A. alternata* and the appearance of *Triodopsis cragini* at the 70 to 80cm level are regarded as evidence of declining abundance of moist habitats and an increase in availability of

TABLE 30

Habitats of Big Hawk Shelter Land Snail Fauna

Species	Moist Wooded Floodplains	Dry Wooded Hillsides	Moist Prairies, Hillside Seeps	Dry Prairies, Rocky Hillsides	Habitat Associations
Anguispira alternata	X				
Strobilops labyrinthica	X				
Gastrocapta corticaria	X				
Mesodon t. thyroides	X				A
Stenotrema leai aliciae	X				
Euconulus sp.	X				
Succinea sp.	X				
Polygyra d. dorfeuilliana		X			
Triodopsis cragini		X			B
Polygyra-Triodopsis, broken		X			
Helicodiscus parallelus	X		X		
Zonitoides arboreus	X		X		C
Gastrocapta contracta	X		X		
Vallonia parvula	X		X		
Nesoritrea indentata	X		X	X	
Hawaiia minuscula	X		X	X	D
Gastrocapta armifera	X		X	X	

dry habitats. Species-habitat frequencies of the entire fauna show the general trend of greater abundance of moist habitats in the past although not as clearly as the single *A. alternata* profile. When the two wet habitat categories (A and C) are joined, the same pattern again emerges except that decline in moist habitat frequency begins later in the record, at the 30 to 40cm level instead of the 80 to 90cm level as determined by *A. alternata* and category A alone.

Paleoenvironmental Discussion and Synthesis

The pollen and land snail succession from Big Hawk Shelter and the land snail records from Copperhead Cave and Cedar Creek Shelter indicate the same history of environmental conditions and change during the past 1700 years. The pollen sequences from Cut Finger Cave and Cedar Creek Shelter are not very useful for paleoenvironmental applications. Big Hawk covers the greatest time span, dating from A.D. 200 to A.D. 1500, and its pollen and land snail sequence is the most reliable and best dated in the region. The record from Big Hawk Shelter will probably serve as a standard for comparison with other site records in the southeast plains (Figure 28).

The comparatively great abundance of the moist habitat, floodplain forest snail *Anguispira alternata* and the high frequencies of hickory pollen in the up to 90cm interval at Big Hawk both indicate a time of greater available moisture, probably increased precipitation, from that of today. The pollen sequence, and especially the land snails succession which extends 30cm greater in depth than does the pollen, further indicates that the moist period was preceded by a drier interval, the antiquity of which goes beyond the dated rockshelter sediments but which was probably similar to the present-day climate. The peak in abundance of *A. alternata* shells and hickory pollen is radiocarbon dated about A.D. 400 to A.D. 600. After A.D. 600, until at least A.D. 1500, the climate became drier, a trend that probably continued to the present, although that is not known since a sedimentary record for the past 400 to 500 years in Hominy Creek Valley has yet to be identified.

The appearance of the dry habitat, wooded hillslope species *Triodopsis cragini* at Big Hawk Shelter in conjunction with the beginning decline of the *A. alternata* and hickory may indicate that the change in climatic conditions was sudden rather than gradual. If, for example, precipitation values determine the rise and fall of *A. alternata* and hickory abundance, the dry habitat snail, *T. cragini*, should not appear until later in the record when the precipitation has dropped to near pre-wet period values which, in this case, would be perhaps at the very top level of the rockshelter. On the other hand, if the greater amounts of precipitation responsible for the wet period were suddenly stopped, the decrease in abundance of moist habitats suitable to *A. alternata* and the diminishing importance of hickory in the upland oak forest would still take place and would be recorded in the fossil record as found at Big Hawk Shelter. But, with the sudden change in climate, the snail *T. cragini* that prefers dry rocky wooded hillslopes would be able to move into the area at the same time that *A. alternata* and hickory, although largely on their way out, are still present. The next question, one that was raised in the pollen analysis section, is this: if an environmental shift, such as a change in climate, occurs with comparative suddenness, what will be the rate of replacement as one species diminishes in importance? The answer probably involves a number of facets, such as the species affected adversely versus those affected favorably and the nature and magnitude of the

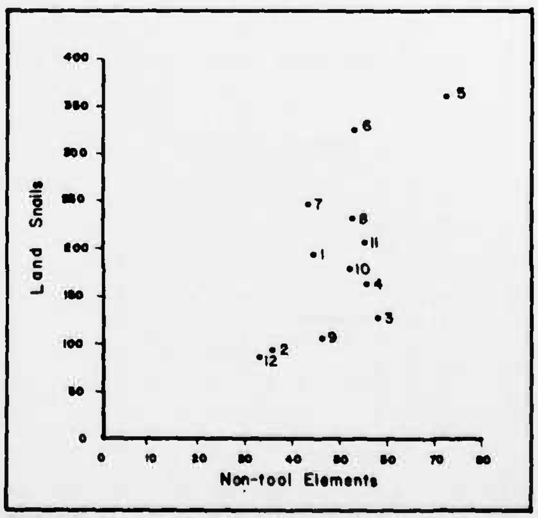


FIGURE 26: Average land snail and non-too element concentrations (specimens per 0.1 cu m) per level, Big Hawk Shelter (34OS114), 1977 excavations; numbers refer to levels.

environmental change. In this case, hickory pollen frequencies reach modern values about A.D. 1050 which means that the hickory component of the forest steadily declines over a 450 year period while being replaced by oak. In the Big Hawk snail sequence the uppermost level, perhaps historic in age, has the lowest abundance of *A. alternata* shells. It is impossible to judge if this low abundance represents an end to *A. alternata* decline or if it will continue into the future, a problem that confronts all investigations of recent and late prehistoric vegetation and faunal changes.

The land snail succesions from Copperhead Cave and Cedar Creek Shelter both show decreasing frequencies of *Anguispira alternata* in the upper half. The *A. alternata* decline at Cedar Creek (level 3, 60 to 70cm depth) is dated A.D. 940, about 300 years after the *A. alternata* decrease in the Big Hawk Shelter record. Regardless of the actual timing of the change, the decreasing frequencies of the land snail *A. alternata* is repeated in three sites in Hominy Creek Valley and is an event that may be of regional significance. Although all three sites show the decline of *A. alternata*, only Big Hawk's record extends back far enough in time to document the rise in *A. alternata* frequencies. The rise and great abundance of *A. alternata* is interpreted as a period of more moist climate than today's. Its decline marks change in climate to drier conditions, probably similar to those of today. The return to drier climate probably began sometime between A.D. 600 to A.D. 1000.

Summary

In summary, the appearance of *Triodopsis cragini* is interpreted as an abrupt end of the moist climatic period that encouraged the increase in *Anguispira alternata* and hickory. Thus, although *A. alternata* and hickory remain in the area, their numbers decline steadily over the centuries. Figure 28 summarizes the snail and pollen data from Big Hawk Shelter and shows the writer's interpretation of the climatic zonation. The interpretation of a climatic shift at the peak of a pollen or faunal zone diverges from the general practice of equating both increasing and decreasing frequencies with a single environmental event. However, the short intervals of time that are being dealt with at Big Hawk Shelter permit the analyst to consider short-duration vegetation and faunal changes in terms of minor climatic shifts and resulting competition and succession. The kinds of vegetation and faunal changes documented at Big Hawk Shelter, especially the land snail succession, represent small shifts within already established major community types. The subtle shifts within a

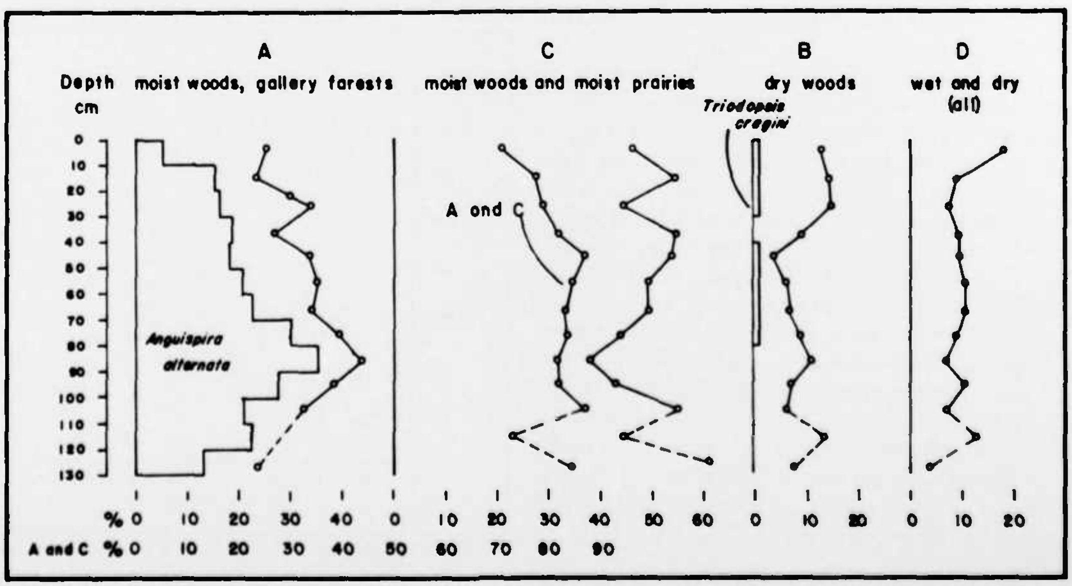


FIGURE 27: Shell frequencies grouped in habitat associations; see discussion in text.

single faunal or vegetation type may only be recorded in the fossil record where sedimentation rates are sufficiently rapid for them to be sampled in a geologic context.

SUMMARY AND CONCLUSIONS

The Phase II investigation of the archaeological sites within Hominy Creek Valley provided for the correlation of late Holocene geologic and environmental events between various study areas within the Verdigris Basin, a more precise definition of the settlement patterns of the prehistoric occupants of the valley, and a model for Late Prehistoric adaptive strategies within the region.

Late Holocene Environment and Geology

A synthesis of the currently available evidence for archaeological, geologic, palynologic, and malacologic successions within the Verdigris Basin allows for the reconstruction of a general environmental and climatological sequence for the region during the last 2000 years (Figure 29).

Prior to the Phase II investigation, only a limited study had been made of the Hominy Creek Valley floodplain (Hall, 1977a) due to the emphasis upon the excavation of the protected sites located on the flanks of the valley. A more detailed examination of the alluvial history of the valley, conducted during Phase II, confirms a sequence of events similar to that described for the Little Caney River (Hall, 1977b; Keyser and Farley, 1979) although both sequences can now be more precisely defined as a result of the Hominy Creek Valley study.

Skiatook Paleosol

The Skiatook Paleosol, probably of Pleistocene age, appears to have represented an eroded surface on which the earliest documented prehistoric occupation of Hominy Creek Valley took place. The thick red paleosol is presently exhumed or only shallowly buried on hillslopes and ridge-toes while being deeply buried on the valley floor by Unit B alluvium (Figure 30). The relationship of this red paleosol to the Copan Paleosol has been of considerable concern since their recognition and description (Hall, 1977a). Although it was initially proposed that the red paleosol represented a lateral, upland facies of the Copan Paleosol (Henry, 1977b:125–26), more recently acquired evidence of archaeologic affiliations and radiocarbon dates for the paleosol complicated the issue. In order for the soils to have been lateral facies, the synchronous formation of the Copan Paleosol and the erosion of the red paleosol would have had to have occurred (Keyser and Farley, 1979:59–60).

The discovery of an exposure on the east bank of

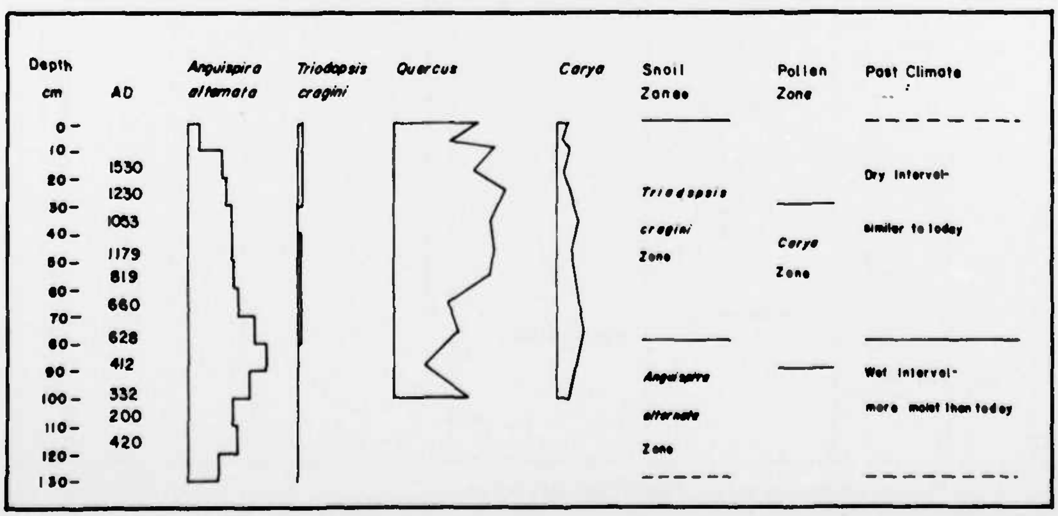


FIGURE 28: Summary chart of Big Hawk Shelter (34OS114) with land snail, pollen, and paleoclimatic zones; 0-10 cm interval may be historic is age; if so, a 400 year unconformity exists at the 10 cm horizon.

Hominy Creek near the Hominy Bridge Site appears to resolve the relationship of the two paleosols. The red paleosol is revealed at the base of a section, exposed by construction activities, with fine grained alluvium (Unit B), the Copan Paleosol, and an upper alluvium (Unit A) superimposed in stratigraphic order. The red paleosol clearly is not a lateral facies of the Copan Paleosol, but an older soil separated from the Copan Paleosol by Unit B alluvium. To avoid further confusion it is proposed that this older red soil be referred to as the Skiatook Paleosol.

The age of the Skiatook Paleosol is presently unclear although it would appear to be of Pleistocene age, judging from the high clay content and 5–7.5 YR readings for its thick B horizon. A radiocarbon date, from the overlying Unit B alluvium along the Little Caney River, of 31 ± 76 B.C. (SMU-357) provides a maximum age for one burial of the paleosol, but the date is not particularly helpful in determining the age of formation. The discovery of Archaic horizons within the Skiatook Paleosol at the Hominy Bend and Hominy Bridge sites initially suggested a late Holocene age for its formation. It was brought to my attention, however, that such an age would not be in concert with the characteristics of the paleosol which imply considerable antiquity. Given the association of the Skiatook Paleosol with Archaic sites within the valley, the paleosol probably provided an eroded older surface on which Archaic encampments were placed. Soil cracks and other agencies of natural disturbance may then have worked Archaic artifacts into the paleosol. Although there is no direct evidence for an environmental setting of the Archaic occupation of the valley due to an absence of a depositional unit of this age on the

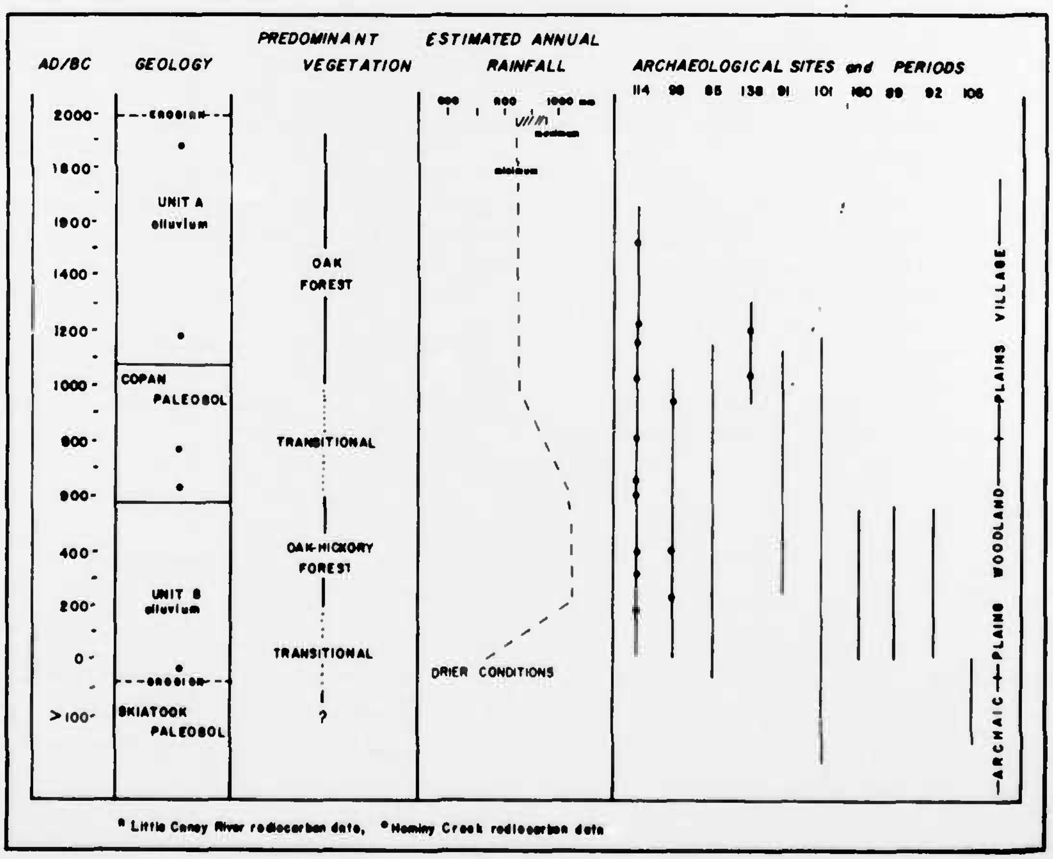


FIGURE 29: A synthesis of geologic, paleoenvironmental, and archaeologic evidence for the Late Holocene of Hominy Creek Valley.

floodplain, the basal units of the Big Hawk Shelter point to a drier setting for this interval.

Unit B Alluvium

Subsequent to the erosion of the Skiatook paleosol, it was buried by Unit B alluvium during an aggradational episode within the valley. The deposition of Unit B appears to have taken place from ca. 100 B.C. until approximately A.D. 600. The dating of this interval is based upon archaeologic associations and the previously mentioned radiocarbon determination. Several Woodland Period sites (Williams Site, Sites 34OS89 and 34OS92) are buried in Unit B alluvium up to 3m.

The pollen and snail diagrams developed from evidence obtained in rockshelter excavations denote the emergence of an oak-hickory forest during the deposition of Unit B. The erosion of the Skiatook paleosol and the subsequent rapid deposition of the thick alluvial Unit B would be in concert with the postulated increase in annual precipitation.

Copan Paleosol

The Copan Paleosol began to form on Unit B alluvium sometime ca. A.D. 600 and continued until ca. A.D. 1100. Three radiocarbon dates define this 700-year span of soil formation and as would be expected Plains Woodland and Plains Village Period horizons are associated with the soil (Keyser and Farley, 1979).

The formation of the soil is synchronous with the onset of slightly drier conditions, equivalent with the modern setting, and the attendant replacement of oak-hickory with predominantly oak forests as evidenced by pollen and snail successions. It is estimated that precipitation declined on the order of 200mm as based upon the modern annual precipitation parameters for oak and oak-hickory forests.

Unit A Alluvium

The formation of the Copan paleosol was terminated by the deposition of Unit A alluvium with the aggradational episode continuing until the later part of the last century. Archaeological sites found within the alluvium would therefore be confined to Plains Village and Historic Periods. Within the Hominy Creek Valley the oak forest which emerged during the formation of the Copan paleosol appears to have persisted throughout the deposition of Unit A into modern times.

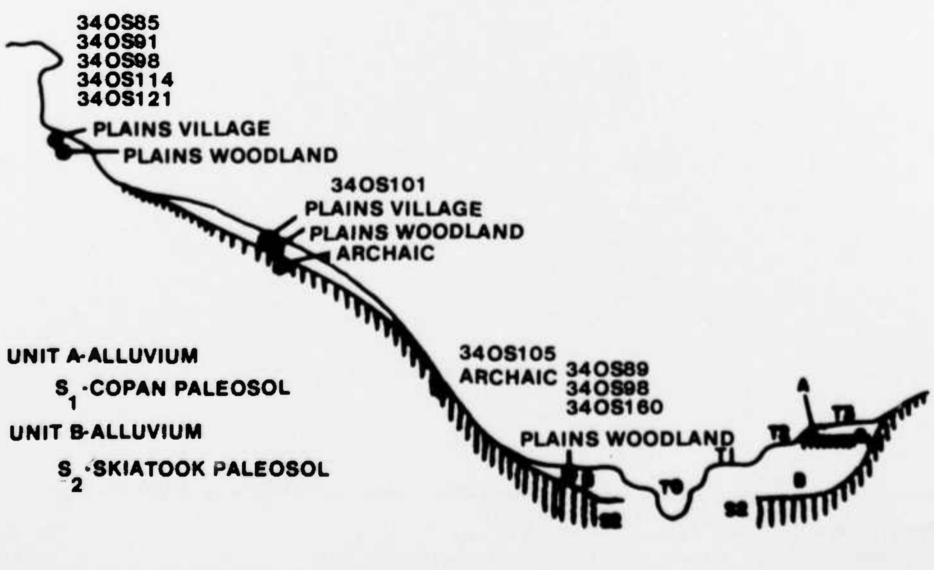


FIGURE 30: Generalized cross-section of the Hominy Creek Valley showing the positions of the sites, the cultural-historic components, and the geologic deposits.

The aggradation of the valley appears to have been terminated during the early part of this century by downcutting. At least two periods of entrenchment are evident, with the last occurring in the 1930's. The development of extensive oil fields in the area in the early 1900's in association with a deforestation program to increase grazing land may have precipitated the downcutting.

Site Distributions and Settlement Patterns

Perhaps the most tangible body of archaeological evidence which is reflective of prehistoric adaptive strategies is that related to past settlement systems. In that settlement systems express the interplay of environmental, economic, demographic, and social forces influencing a population, the patterns which

TABLE 31

Summary Data on Non-tool Density, Tool to Non-tool Ratio, and Area (M^2) of Excavated Sites within Hominy Creek Valley.

Site	Non-Tool Density	Tool:Non-Tool	Area(M2)
34OS85			
PV	43.1	1:36	112
W	144.1	1:34	112
34OS91			
PV	4.1	1:22	192
W	8.1	1:45	192
34OS98			
PV	80.7	1:198	108
W	353.2	1:70	108
34OS114			
PV	52.9	1:48	148
W	46.6	1:36	148
34OS138			
PV	19.8	1:5	40+
34OS101			
PV	352.3	1:135	1,200
W	166.1	1:161	1,200
AR	435.5	1:163	1,200
34OS160			
W	72.0	1:145	20,000
34OS105			
AR	30.1	1:163	2,000

PV – Plains Village
W – Woodland
AR – Archaic
+ – Total area could not be determined due to rockfall.

can be recognized in the distribution of sites assist in defining the strength and direction of these forces.

Archaic Sites

As previously discussed, only two Archaic Period sites have been investigated. Although the small number of sites precludes definition of settlement pattern for the Archaic Period, the Phase II investigation does provide some important information in respect to site distribution. Archaic Period sites are confined to the Skiatook Paleosol and their distribution is, therefore, limited to the exposure of the paleosol on the flanks of the valley. As a consequence of erosion of the paleosol in the uplands and burial on the flood plain, Archaic Period sites will probably not be found in these settings. The differential exposure of the Skiatook Paleosol and the attendant distribution of Archaic Period sites needs to be considered when evaluating settlement patterns for the period. The absence of Archaic horizons from the rockshelter deposits, which were apparently not subject to the geologic processes operative in the uplands and on the valley floor, has been a perplexing phenomenon. Why the rockshelters were intensively utilized during the succeeding Plains Woodland and Plains Village Periods, but not inhabited during the Archaic Period was a major question of the initial investigations (Henry, 1978b:3). If the proposed paleoclimatic reconstruction is correct, the protected sites located on the small side tributaries of Hominy Creek may not have had direct access to water during the drier, Archaic Period, interval. Additionally it could be argued that Big Hawk Shelter, located on the main channel, failed to reveal an Archaic horizon from over 2m of deposit underlying the Woodland horizon because the channel was located too distant from the shelter during the Archaic occupation of the valley.

An examination of the non-tool densities, tool: non-tool ratios, and areas of the sites (Table 31) shows considerable similarity between the two Archaic sites (34OS101, 34OS160) with the exception of site density. The markedly greater density exhibited by the Hominy Bend Site (34OS101) Archaic component implies that the site was more intensively utilized than the Hominy Bridge Site (34OS105).

Woodland and Plains Village Sites

In that the Plains Woodland and Plains Village Period inhabitants of the valley appear to have utilized the same settlement pattern, they may be described together. Prior to the Phase II investigation, only the Hominy Bend Site (34OS101) provided information on the utilization of the valley floor by Late Prehistoric peoples, for investigations had been confined to the protected sites on the flanks of the valley.

The examination of the caves and rockshelters provided significant evidence pertaining to the site activities, economy, and seasonality of residence of their prehistoric occupants. As a result of the Phase II investigation, this information can be integrated with evidence obtained from excavation of the sites on the valley floor to obtain a clearer, more precise picture of the settlement systems employed by the Late Prehistoric inhabitants of the valley.

The initial investigation (Henry, 1977a, 1978b) indicated that a central based circulating pattern of settlement was operative during the Late Prehistoric occupation of the valley. Specifically, it was suggested that the Late Prehistoric (Plains Woodland and Plains Village Period) inhabitants of the valley lived in small groups during the late summer and autumn and congregated in large groups during other seasons. The proposal was based upon comparing the site areas, seasonality of residence, intra-assemblage tool-kit diversity, inter-assemblage tool-kit diversity, range in lithic technology according to reduction sequence, artifact density, and tool to non-tool ratios of the investigated sites to predicted attributes of three hypothetical settlement patterns (Henry, 1977a: 159–69). These hypothetical patterns included a radiating pattern (Mortensen, 1972), a restricted circulating pattern, and a central based circulating pattern (Beardsley, et al, 1956; Hole and Flannery, 1967; MacNeish, 1972).

The Phase II investigation provides additional support for the proposed central based circulating settlement pattern. Due to the paucity of tools and evidence for seasonality of occupation from the open sites on the floodplain, a comparison of both protected and open sites is restricted to the common variables of non-tool density, tool:non-tool ratio, and area of occupation (Table 31).

The protected site—open site dichotomy, is paralleled by site area, with the rockshelters and caves displaying markedly smaller occupation areas than the open sites. The protected sites also exhibit less variation in area between sites. The variation in area of the open sites is considerable, ranging from 1,200 to 20,000 sq. m. If the floor areas of the protected sites are used as a basis for estimating maximum group population of the inhabitants of the shelters, the groups should have consisted of from 12 to 17 people. These estimates were developed utilizing an allometric growth model (Wiessner, 1974) which was derived from ethnographic data for group size and occupation space for hunters and gatherers and not based upon arithmetic calculations (i.e. 1 person per 10 m sq) for floor area as based on agriculturalists (Naroll, 1962). In that the maximum size of the groups which inhabited the shelters is less than the minimum number of people (i.e. 25) needed to sustain the social and biologic requirements of a band (Wobst, 1974:157, 170; Williams, 1974:27), the occupants of the protected sites appear to have been in a dispersed mode relative to their settlement cycle. Ethnographic literature, in fact, reveals a remarkable cross-cultural regularity in hunter-gather societies as bands consistently minimally contain approximately 25 persons (Birdsell, 1968:239; Lee and DeVore, 1968:245). It should also be noted that the sheltered sites were relatively long-term residential encampments as evidenced by thick, rich middens, permanent features (i.e. bedrock mortars and grinding areas), and disposal of the dead. These sites, then, were not manifestation of ephememeral exploitation camps. If as suspected, the protected sites represent dispersed mode occupations during the autumn-winter months, then the Late Prehistoric groups must have coalesced elsewhere during the other seasons of the year in order to maintain a minimum band level of 25 persons. Although site area alone is not a sufficient measure for determining whether the site was occupied by micro- or macro-bands, taken in conjunction with artifact density and tool to non-tool ratio, site area can be used to differentiate between dispersed and coalesced occupations and the timing of these occupations.

Open sites should exhibit lower artifact densities than protected sites, given the larger areas of the former, if the sites were occupied by equivalent numbers of people. On the other hand, if the open sites were occupied by larger numbers of people proportionate to the areas of the sites, then higher artifact densities would be expected. An examination of these data, relative to the two Late Prehistoric open site occupations reveals that the Hominy Bend Site (34OS101) represented a coalesced encampment for the Woodland and Plains Village occupants, while the Williams Site (34OS160) reflects a dispersed mode valley floor encampment for Woodland Period inhabitants. The presence of daub, indicative of structures, and the lack of horizontal variation in artifact density over the 1,200 sq. m. Hominy Bend Site provide additional evidence for the size and permanency of the camp. On the other hand, the marked variation in artifact density across the more than over 20,00 sq. m. of the Williams Site implies that the great area of coverage may be attributed more to numerous ephemeral encampments by micro-bands than by a more permanent occupation by coalesced groups.

The tool to non-tool ratio evinced by an assemblage is viewed as an index of the degree of tool curation associated with the assemblage. In those assemblages with low numbers of tools relative to non-tools, a considerable amount of initial reduction must have been conducted prior to tool manufacture. When tools occur in relatively high proportions to non-tools, final processing activities associated with final fabrication, maintenance, and rejuvenation of tools are indicated. With the exception of the Plains Village horizon of Cedar Creek Shelter (34OS98), a clear dichotomy exists between protected and open sites in respect to tool curation. The high numbers of tools relative to non-tools in the protected site assemblages implies that little initial tool manufacture was being conducted at the sites and that the tools were being curated through maintenance and rejuvenation. The assemblages of the open sites reflect little tool curation activity.

Given the lack of availability of chert within the valley, the differences in curation behavior associated with protected as opposed to open site occupations must be attributed to the timing of the occupations, in respect to when the raw material entered the valley's settlement cycle. In that chert is not found in Hominy Creek Valley, all of the raw materials used for chipped stone tools had to be imported. The raw material comes from sources to the west and northwest (Neva, Foraker, and Florence cherts) and the east (Keokuk and Tahlequah cherts). It is suggested that the raw material was introduced to the valley during the spring-summer months when the inhabitants were coalesced into macro-bands. Within this setting most of the raw material was manufactured into tools which were subsequently curated when the groups dispersed into micro-groups. The question of what mechanisms were used for the acquisition of the raw material remains unanswered. While direct procurement of cherts to the west may have been conducted in conjunction with bison hunting (Henry, Hall, and Butler, 1979, a trading network to the east is certainly suggested by the presence of shell tempered pottery and obsidian.

Regional Adaptive Strategies

Traditionally the Plains Woodland Period has been viewed as economically transitional between Archaic Period hunter and gatherers and Plains Village Period horticulturalists (Wedel, 1964). The investigation of the prehistoric sites within Hominy Creek Valley, however, has failed to furnish evidence for food-production during the Plains Village Period, although wild plant products have been recovered in quantity. The Late Prehistoric inhabitants of Hominy Creek Valley apparently did not experience the dramatic subsistence and demographic changes which were associated with the Plains Woodland to Plains Village transition that occurred elsewhere within the region. The cultural and economic continuity seen in Hominy Creek Valley may have been more the rule than the exception within the oak forest belt, the Cross-Timbers, which forms the eastern margin of the grassland on the Southern Plains.

The beginnings of horticulture on the Plains have been attributed to an adoption of domesticates from the east during a period of climatic amelioration ca. A.D. 800 (Lintz, 1974; Baerreis and Bryson, 1965; Krause, 1970:112). While this proposal may be appropriate for explaining the appearance of domestication in areas which were occupied by expanding populations of food-producing societies, it seems less plausible for those areas where stimulus diffusion must be invoked as a mechanism for the spread of horticulture.

An Alternative Model

In that the culturally distinct Cross-Timbers separate the eastern Woodlands from the grasslands throughout the Southern Plains, it would appear that domesticates were adopted from the east as opposed to being introduced by the actual spread of peoples into the area. The proposed transition from hunting and gathering to food-production during a period of greater precipitation, however, is not supported by the paleoclimatic reconstruction which indicates an onset of drier conditions within the region, at ca. A.D. 800, prior to the earliest evidence for domesticates on the Southern Plains (Lintz, 1974).

Although these drier conditions do not appear to have significantly altered the adaptive strategies of populations inhabiting the Cross-Timbers, perhaps due to the persistence of forest and riverine environments, the groups living on the grasslands west of the Cross-Timbers may have experienced a considerable modification to their environment due to the inherently drier setting. A reduction in grassland would have been associated with a corresponding loss of biomass (particularly bison). Available water would have been restricted to major tributaries, and riverine forests would have retreated to lower order drainages. The reductions in food, water, and fuel would have precipitated population pressures within environments on the grasslands where these resources were found in higher densities. It is suggested these events lead to an adoption of horticulture along the major drainages.

Recommendations

As a result of the Phase II investigation, it is recommended that additional work be undertaken at 34OS92 and 34OS160, while no additional work is suggested for: 34OS90, 34OS91, 34OS84, 34OS89, 34OS105, 34OS93, 34OS110.

The additional investigation of 34OS92 should attempt to delimit the subsurface areal extent of the site through extensive test excavations. Subsequent to periodic plowing of the site, the surface concentrations of artifacts appear to change in their areal distributions. This observation may suggest that *in situ* materials are being introduced into the plow zone in various areas of the site as the field is defaulted through cultivation and erosion.

Future investigations at 34OS160 should concentrate on defining discrete living floors over large areas of the site. The rapid aggradation of Unit B alluvium appears to have preserved short-term episodes of occupation as discrete surfaces. The surfaces are defined by burned rock, chipped stone artifacts, and hearths. The site provides a unique opportunity for examining intra-site patterns within ephemeral Plains Woodland occupations.

In respect to nomination to the National Register of Historic Places, Turkey Creek Shelter (34OS91) and the Hominy Bend Site (34OS101) are considered eligible due to the unique and significant prehistoric evidence associated with the sites. Sites 34OS84, 34OS89, 34OS90, 34OS93, 34OS105, and 34OS110 are not recommended for nomination to the register. Sites 34OS92 and 34OS160 are recommended for further investigation in order to evaluate their significance and eligibility for nomination.

APPENDIX I

Sediment Descriptions From Site 34OS160

Section I.

5–10 cm depth: albic horizon
yellowish red (5 YR 5/6), very fine sand, silty quartz, up to medium sand, noncalcareous, well sorted, subangular, moderately consolidated

20–30cm: paleosol
red (2.5YR 4/8), very fine sand, silty, quartz, up to medium sand, noncalcareous, hard

120–130cm depth: colluvium
red (2.5YR 4/8), very fine sand, silty, quartz, up to medium sand, noncalcareous, well sorted, sand subangular, moderately consolidated

Section II.

20–30cm depth: albic horizon
light reddish brown (5YR 6/4), silt to fine sand, quartz, to medium sand, grains angular, noncalcareous
90–100cm depth: colluvium
red (2.5YR 4/8), very fine sand, silty, to coarse sand, quartz, grains angular but spherical, noncalcareous

Section III.

70–80cm depth: alluvium above colluvium
light brown (7.5YR 6/4), very fine sand, silty, to medium sand, quartz, grains angular, polished, noncalcareous

80–90cm depth: colluvium
reddish yellow (5 YR 6/6), very fine sand, silty, to medium sand, quartz, grains angular, polished, larger grains subangular to subrounded, moderately indurated

110–110cm depth: colluvium
yellowish red (5YR 5/8), fine sand, silty, to coarse quartz sand, noncalcareous, moderately indurated, manganese nodule 0.5mm dia.

Section IV.

130–140cm depth: colluvium
yellowish red (5YR 5/8), very fine sand, silty, to coarse sand, quartz, grains angular, noncalcareous

Section V.

bottom, 270cm depth
reddish yellow (7.5YR 7/8), very fine sand, silty, to medium sand, quartz, noncalcareous, red to reddish yellow mottles, moderately indurated, a few mica grains

REFERENCES CITED

BAERREIS, D. A.; and BRYSON, R. A., 1965. Climate Episodes and the Dating of the Mississippian Culture. Wisconsin Archaeologist 46:203-20.

BEARDSLEY, R. K.; HOLDER, P.; KRIEGER, A. D.; MEGGARS, B. J.; RINALDO, J. B.; and KUTSCHE P., 1956. Functional and Evolutionary Implications of Community Patterning. *In* Seminars in Archaeology: 1955, R. Wanchope, editor. Memoirs of the Society for American Archaeology 11:129-57.

BELL, R. E., 1958. Guide to the Identification of Certain American Indian Projectile Points. Oklahoma Anthropological Society, Special Bulletin, No. 1.

BIRDSELL, J. B., 1968. Some Predictions for the Plaistocene Based Equilibrium Systems among Recent Hunter-Gatherers. *In* Man the Hunter, R. B. Lee and I. DeVore, editors. Chicago: Aldins. pp. 229-40.

BOBALIK, S. J., 1976. Archaeological resources of the Sand Creek Watershed Project, Osage County, Oklahoma. Oklahoma Archaeological Survey Report No. 4.

BUTLER, B. H., 1977. Vertebrate Faunal Remains. *In* the Prehistory and Paleoenvironment of Hominy Creek Valley, 1977 Field Season, D. O. Henry (editor) Laboratory of Archaeology, University of Tulsa Contributions in Archaeology 4. pp. 49-78.

CHEATUM, E. P.; and FULLINGTON, R. W., 1971. The Aquatic and Land Mollusca of Texas. The Recent and Pleistocene Members of the Gastropod Family Polygridae in Texas. The Dallas Museum of Natural History Bulletin I, Part I.

CURRY, B. R., 1970. Climate of Oklahoma. Climatology of the United States No. 60:34 Environmental Data Service, Silver Spring, Maryland.

DUCK, L. G.; and FLETCHER, J. B., 1943. A Game Type Map of Oklahoma. Division of Wildlife Restoration, Game and Fish Department.

GETTYS, M.; and LAYHE, R.; and BOBALIK, S., 1976. Birch Creek and Skiatook Reservoir: Preliminary Report upon Archaeological Investigations in 1974. Oklahoma River Basin Survey, Archaeological Site Report No. 31.

HALL, S. A., 1977a. The Holocene Geology and Paleoenvironmental History of the Hominy Creek Valley. *In* the Prehistory and Paleoenvironment of Hominy Creek Valley, D. O. Henry (editor) Laboratory of Archaeology, University of Tulsa Contributions in Archaeology 2. pp. 12-42.

HALL, S. A., 1977B. The Geology and Palynology of Archaeological Sites and Associated Sediments. *In* the Prehistory of the Little Caney River, 1976 Field Season, D. O. Henry (editor). Laboratory of Archaeology, University of Tulsa Contributions in Archaeology 1. pp. 13-41.

HALL, S. A., 1977c. Geological and Paleoenvironmental Studies. *In* the Prehistory of Birch Creek Valley, D. O. Henry editor) Laboratory of Archaeology, University of Tulsa Contributions in Archaeology 3. pp. 11-31.

HALL, S. A., 1978. Snails from Archaeological Sites in Hominy Creek Valley. *In* the Prehistory and Paleoenvironment of Hominy Creek Valley, 1977 Field Season, D. O. Henry, (editor) Laboratory of Archaeology, University of Tulsa Contributions in Archaeology 4. pp. 78-85.

HENRY, D. O., editor, 1977a. The Prehistory and Paleoenvironment of Hominy Creek Valley. Laboratory of Archaeology, University of Tulsa, Contributions in Archaeology 2.

HENRY, D. O., editor, 1977b. The Prehistory of the Little Caney River: 1976 Field Season. Laboratory or Archaeology, University of Tulsa Contributions in Archaeology 1.

HENRY, D. O., 1978a. Big Hawk Shelter in Northeastern Oklahoma: Environmental, Economic, and Cultural Changes. Journal of Field Archaeology 5(3):269–87.

HENRY, D. O., 1978b. The Prehistory and Paleoenvironment of Hominy Creek Valleys 1977 Field Season. Laboratory of Archaeology. University of Tulsa Contributions in Archaeology 4.

HENRY, D. O., HALL, S. A.; and BUTLER, B. H. in press. The Late Prehistoric Human Ecology of Birch Creek, Northeastern Oklahoma. Plains Anthropologist.

HENRY, D. O.; HAYNES, C. V.; BRADLEY, B., 1976. Quantitative Variations in Flaked Stone Debitage. Plains Anthropologist 21:71.

HOLE, F.; and FLANNERY, K. 1967. The Prehistory of Southwestern Iran: A Preliminary Report. Proceedings of the Prehistoric Society 33:147–206.

KEYSER, J. D.; and FARLEY, J. A., 1979. Little Caney River Prehistory: 1977 Field Season. Laboratory of Archaeology, University of Tulsa's Contributions in Archaeology 5.

KRAUSE, R. A., 1970. Aspects of Adaption Among Upper Republican Subsistence Cultivators. *In* Pleistocene and Recent Environments of the Central Great Plains, W. Dort, Jr. and J. Knox Jones, Jr. Lawrence, Kansas: The University Press of Kansas.

LEE, R. B., and DeVORE, I., editor, 1968. Discussions, Part V. *In* Man the Hunter. R. B. Lee and I. DeVore, editors. Chicago: Aldins. pp. 245.

LINTZ, C., 1974. An Analysis of the Custer Focus and its Relationship to the Plains Village Horizon in Oklahoma. Papers in Anthropology 15(2):1–72.

MacNEISH, R. S., 1972. The Evolution of Community Patterns in the Tehuacan Valley of Mexico and Speculations about the Cultural Processes. *In* Man, Settlement, and Urbanism, P. J. Ucko, R. Tringham, and D. W. Dimbleky, editors. London: Gerald Duckworth and Co., Ltd. pp. 67–93.

METCALF, A. L., 1962. Gastropods of Cowley County, Kansas. Transactions of the Kansas Academy of Science 65:275–89.

METCALF, A. L., 1977. Report on Some Unionacean Bivalve Mollusks from two Archaeological sites in Hominy Creek Valley. *In* the Prehistory and Paleoenvironment of Hominy Creek Valley, D. O. Henry (editor). Laboratory of Archaeology, University of Tulsa, Contributions in Archaeology 2. pp. 43–56.

MORTENSEN, P., 1972. Seasonal Camps and Early Villages in the Zagros. *In* Man, Settlement, and Urbanism, P. Ucko, et al. editors. London: Gerald Duckworth and Co. Ltd. pp. 293–97.

NAROLL, R., 1962. Floor Area in Settlement Population. American Antiquity 27:587–88.

PERINO, G., 1972. A Historical-Cultural Assessment of the Skiatook Reservoir, Osage County, Oklahoma. U.S. Army Corps. of Engineers, Tulsa District, Tulsa.

ROHRBAUGH, C. L.; and WYCKOFF, D. G., 1969. The Archaeological Survey of the Proposed Skiatook Reservoir, Osage County, Oklahoma. Oklahoma River Basin Survey Project, General Survey Report No. 11.

RUHE, R. V., 1970. Soils, Paleosols, and Environment. *In*, Pleistocene and Recent Environments of the Central Great Plains. Dort and Jones, editors. University of Kansas Press, Special Publication, 3.

WEDEL, W. R., 1964. The Great Plains. *In* Prehistoric Man in the New World. J. D. Jennings and E. Norbeck, editors. Chicago: Aldine. p. 203.

WEISSNER, P., 1974. A Functional Estimator of Population From Floor area. American Antiquity 39(2):342-49.

WILLIAMS, B. J., 1974. A Model of Band Society. American Antiquity 39(4): Part 2.

WOBST, H. M., 1974. Boundary Conditions for Paleolithic Social Systems: A Simulation Approach. American Antiquity 39.

DAT

FILM

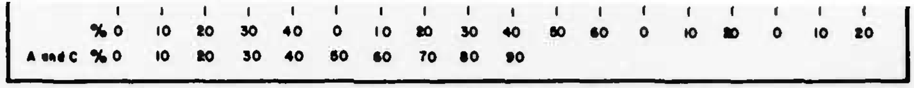


FIGURE 27: Shell frequencies grouped in habitat associations; see discussion in text.

FIGURE 28: Summary chart of Big Hawk Shelter(34OS114) with land snail, pollen, and paleoclimatic zones: 0-10 cm interval may be historic is age; if so, a 400 year unconformity exists at the 10 cm horizon.

tion of site density. The markedly greater density exhibited by the Hominy Bend Site (34OS101) Archaic component implies that the site was more intensively utilized than the Hominy Bridge Site (34OS105).

evidence for seasonality of occupation from the open sites on the floodplain, a comparison of both protected and open sites is restricted to the common variables of non-tool density, tool:non-tool ratio, and area of occupation (Table 31).

The protected site—open site dichotomy, is paralleled by site area, with the rockshelters and caves displaying markedly smaller occupation areas of these occupations.

Open sites should exhibit lower artifact densities than protected sites, given the larger areas of the former, if the sites were occupied by equivalent numbers of people. On the other hand, if the open sites were occupied by larger numbers of people proportionate to the areas of the sites, then higher artifact densities would be expected. An examination of these data, relative to the two Late Prehistoric

materials used for chipped stone tools had to be imported. The raw material comes from sources to the west and northwest (Neva, Foraker, and Florence cherts) and the east (Keokuk and Tahlequah cherts). It is suggested that the raw material was introduced to the valley during the spring-summer months when the inhabitants were coalesced into macro-bands. Within this setting most of the raw material was manufactured into tools which were horticulture.

An Alternative Model

In that the culturally distinct Cross-Timbers separate the eastern Woodlands from the grasslands throughout the Southern Plains, it would appear that domesticates were adopted from the east as opposed to being introduced by the actual spread of peoples into the area. The proposed transition from hunting

PRECEDING PAGE BLANK-NOT FILMED

reddish yellow (7.5YR 7/8), very fine sand, silty, to medium sand, quartz, noncalcareous, red to reddish yellow mottles, moderately indurated, a few mica grains

HALL, S. A., 1978. Snails from Archaeological Sites in Hominy Creek Valley. *In* the Prehistory and Paleoenvironment of Hominy Creek Valley, 1977 Field Season, D. O. Henry, (editor) Laboratory of Archaeology, University of Tulsa Contributions in Archaeology 4. pp. 78–85.

HENRY, D. O., editor, 1977a. The Prehistory and Paleoenvironment of Hominy Creek Valley. Laboratory of Archaeology, University of Tulsa, Contributions in Archaeology 2.

Survey Report No. 11.

RUHE, R. V., 1970. Soils, Paleosols, and Environment. *In*, Pleistocene and Recent Environments of the Central Great Plains. Dort and Jones, editors. University of Kansas Press, Special Publication, 3.

WEDEL, W. R., 1964. The Great Plains. *In* Prehistoric Man in the New World. J. D. Jennings and E. Norbeck, editors. Chicago: Aldine. p. 203.

DTIC